

## Tech Trends 2013 Elements of postdigital



# Preface

Welcome to Deloitte's annual report examining trends in technology put to business use. Once again, we've selected ten topics that have the potential to impact businesses over the next 18 to 24 months.

Developing the list of trends is an ongoing process of primary and secondary research. The process includes:

- Feedback from client executives on current and future priorities
- Input from Deloitte industry and practice leaders
- Perspectives from industry and academic luminaries
- Research from alliance partners, industry analysts, and competitor positioning
- Crowd-sourced ideas and examples from our global network of practitioners

This year's theme, *Elements of postdigital*, examines the convergence and controlled collision of five forces – Analytics, Mobile, Social, Cloud, and Cyber – as businesses move closer to achieving the possibilities of the Postdigital Enterprise™, where all five forces are mature, implemented, integrated, and baked-in instead of bolted-on. These five forces offer a new set of tools for business, opening the door to a new set of rules for operations, performance, and competition. IT can deliver engagement and empowerment to business customers, both innovating and industrializing.

The Postdigital era, like the post-*industrial* era, reflects a “new normal” for business and a new basis for competition. In post-industrial times, we didn't forego industrialization, we embraced it. The Postdigital era is similar, but with digitalization as its core.

It's an uncommon time to have five forces – all newly emerged, all evolving, all technology-centric – already impacting business so strongly. It is an opportunity for IT to deliver extraordinary value via modest investments on top of a strong legacy technology footprint.

Our 2013 report shares ten trends grouped into two categories. *Disruptors* are opportunities 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 because of new developments or opportunities. Enablers may be more evolutionary than revolutionary, but the potential is often there nonetheless to elevate the business game.

Each trend is presented with multiple examples of adoption to show the trend at work. Each also includes an external point-of-view in the *My Take*. This year, you'll also find a new section called *Flying Car Future*, which takes a provocative view into where the trend may be headed in Horizon 3 – and beyond.

Each of the 2013 trends is relevant today. Each has significant momentum and potential to make an impact. And 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. Provoke and harvest disruption. Don't get caught unaware or unprepared.

Thank you for your interest in this year's report. We welcome your feedback and questions. To the many executives who have provided input into Tech Trends 2013, thank you for your time and insight. We look forward to having more of the essential dialog between business and IT.



Mark E. White  
Principal and CTO  
Deloitte Consulting LLP  
mawhite@deloitte.com  
Twitter: @markatdeloitte

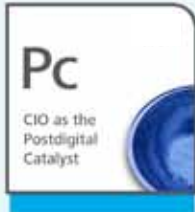


Bill Briggs  
Director and Deputy CTO  
Deloitte Consulting LLP  
wbriggs@deloitte.com  
Twitter: @wdbthree

# At a Glance

## Disruptors

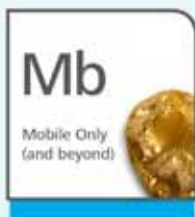
Opportunities that can create sustainable positive disruption in IT capabilities, business operations, and sometimes even business models.



### CIO as the Postdigital Catalyst

#### Catalyzing value from the elements of mobile, social, analytics, cloud and cyber

CIOs can lead the move to tomorrow – reshaping business as usual, and driving innovation. On the one hand, they face unprecedented opportunity for innovation. On the other, the existential threat of disruption. How should business respond? And who better to lead than the CIO? When CIOs harness the convergence of the five postdigital forces, they can change the conversation from systems to capabilities and from technical issues to business impact. Plan big, start small, fail fast, scale appropriately.



### Mobile Only (and beyond)

#### The enterprise potential of mobile is greater than today's smartphone and tablet apps

Mobile should be top of mind for organizations. But don't limit your ideas to Mobile First. Think *Mobile Only*, imagining an untethered, connected enterprise. The next wave of mobile may fundamentally reshape operations, businesses and marketplaces – delivering information and services to where decisions are made and transactions occur. And the potential goes far beyond smartphones and tablets to include voice, gesture and location-based interactions; device convergence; digital identity in your pocket; and pervasive mobile computing. The very definition of mobile is changing.



### Social Reengineering by Design

#### How work gets done is no longer constrained by 19th century platforms

Businesses are no longer building technologies just to enable interaction – they are now engineering social platforms for specific context – platforms that can relieve rather than serve traditional organizational constraints such as deep hierarchies, command-and-control cultures, physical proximity and resource concentration. Social reengineering can fundamentally transform how work gets done, but it isn't just a "project." It's a strategy. And it's not serendipity. It's intentional – by design.



### Design as a Discipline

#### Inherent, pervasive and persistent design opens the path to enterprise value

Driven by consumer experience, intuitiveness and simplicity are moving from IT aspirations to enterprise mandates. Design is not a phase; it's a way of thinking. Beyond look and feel, beyond user interfaces. Isolated in silos of user experience (UX), marketing and product development, individual design functions may be reaching their limits. What's needed is a collaborative, immersive environment to work together. Design is not just an "IT thing" or a "marketing thing" or a "product engineering thing." It's an *enterprise* thing.



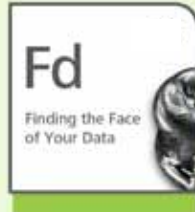
### IPv6 (and this time we mean it)

#### Ubiquitous connected computing is straining the underlying foundation of the Internet

Internet Protocol is the foundation of networking, but we've run out of addressable space for addressable items. The more important it is for your business to connect with the outside world, the more important IPv6 is for your future – and the more urgent this issue is for you today. IP addresses are woven deep into applications and infrastructure, and migration can bring challenges. While there's no drop dead date for IPv6, the final IPv4 address blocks have already been allocated. Careful and proper adoption will take time for planning, execution and verification. The time to start is now.

## Enablers

Technologies in which many CIOs have already invested time and effort, but which warrant another look because of new developments or opportunities.



### Finding the Face of Your Data

**Fuse people and technology to discover new answers in data – and new questions, too**

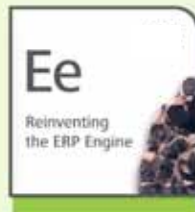
Humans do some things really well, while computers are better at other things. It is this particular combination that enables the identification of new patterns and relationships across dimensions of data – structured and unstructured, internal or external, big or otherwise. By combining human insight and intuition with machine number-crunching and visualization, companies can answer questions they've never answered before. More importantly, they can discover important new questions they didn't know they could ask.



### Gamification Goes to Work

**Driving engagement by embedding gaming in day-to-day business processes**

Gamification can encourage engagement and change employee, customer and supplier behavior, creating new ways to meet business objectives. The goal is to recognize and encourage behaviors that drive performance – sometimes in unlikely places. This trend has moved beyond hype and is already demonstrating business value. Gamification in the workplace incorporates social context and location services to motivate and reward desired behaviors in today's mobile-social world.



### Reinventing the ERP Engine

**Revving up data, hardware, deployment and business model architectures at the core**

If you could really get ERP cheaper and faster, what would you do differently? Run materials requirement planning (MRP) many times each day? Close the books in a matter of minutes? Optimize delivery routes on-the-fly in response to new orders, traffic or customer preferences? What would it mean for business agility, capability and competitiveness? ERP is no stranger to reinvention, overhauling itself time and again to expand functionality. But the underlying engine has remained fairly constant. That's now changing.



### No Such Thing as Hacker-proof

**If you build it, they will hack it. How do you deal with that?**

You've either been breached – or you soon will be. Your boss knows it, your business knows it, your board knows it, your customers know it, and hackers know it. It's your job to deal with it. That means changing the way you think about defending yourself. Be more proactive about the threat – and react more rapidly when breaches do occur. Detect them quickly, respond, clean up and adjust your tactics. Be outward-facing, prepared and ready in advance. Anticipate and prevent when possible, but be ready to isolate and encapsulate intrusions to minimize impact. It's better to lose a finger than to lose an arm.



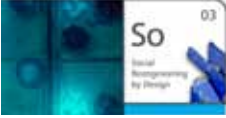


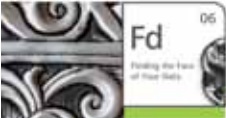






### The Business of IT

**After reengineering the rest of the business, IT's children deserve some shoes**

Fragmented processes and systems can prevent IT from effectively delivering on the changing demands of the business. IT may need to transform its own management systems to keep up. Is this ERP for IT? Maybe someday. Today, CIOs are crafting solutions from industry-leading products and testing business cases at each step. And the potential benefits are worth the investment – not only in driving down costs and better managing risks, but in positioning IT as the business partner in provoking and harvesting disruption in the Postdigital era.

# Contents

	CIO as the Postdigital Catalyst.....	1
	Mobile Only (and beyond) .....	10
	Social Reengineering by Design.....	18
	Design as a Discipline .....	27
	IPv6 (and this time we mean it).....	35
	Finding the Face of Your Data .....	43
	Gamification Goes to Work .....	52
	Reinventing the ERP Engine.....	60
	No Such Thing as Hacker-proof .....	68
	The Business of IT.....	76
	Conclusion.....	85
	Contributors.....	86

**Di**

**Disruptors**



# 1 CIO as the Postdigital Catalyst

## Technology-centric forces are driving business innovation. Who will lead the charge?

Five macro forces – analytics, mobile, social, cloud, and cyber – are hard at work enabling and disrupting organizations of many shapes and sizes. The Postdigital Enterprise™ provokes and harvests these disruptions by changing operating models, capabilities, and perhaps even business models. Industrialization wasn't complete when we entered the post-industrial era; it had simply become the new basis for competition. The same holds true for these digital forces in the Postdigital era.

CIOs are in a unique position to be the harbingers of change. To serve as catalysts across the executive suite, helping others understand the boundaries of the possible. To force thinking beyond venerating existing solutions and processes. To stand accountable for realizing transformation.

In almost every organization, the relationship between the business and IT is – at best – complicated. On one hand, technology lies at the heart of the business strategy – a tool for efficiency and an engine for growth. On the other hand, IT departments should manage the realities of being a high profile cost center – in many companies they are the single largest expense on the balance sheet<sup>1</sup>. It's no wonder that a recent Gartner study reported that 45% of IT leaders report to the CFO, more than to any other executive, and that this represents an increase of 3% from 2011 to 2012<sup>2</sup>. There are shrinking budgets, a shrinking tolerance for long projects, and an end-user community whose benchmark for effective IT initiatives has shifted from enterprise systems to consumer products – notably around the definitions of responsiveness and usability.

At the same time, the five postdigital forces are changing the very nature of IT. Mobile has destroyed constraints based on physical location. Users now expect that the power of the enterprise should be available at the point where decisions are made and where business is transacted – no matter where that is. Social is flattening internal hierarchies, rewriting the possibilities of global

collaboration inside and outside of organizational boundaries, and allowing engagement with consumers as individuals – customer segments of one. Analytics is unlocking insights from data to support human decision making – from big data and transactional data to what's in-between – using advanced statistical models and visualization techniques to fuel descriptive, predictive, and prescriptive decision and action. Cloud has changed the economics and cadence of technology investments. On the subscriber side, a growing collection of services is available for subscription – with an acquisition model that is elastic in both cost and capacity. On the provider side, cloud presents opportunities to monetize information and services in new ways – new or adjacent business models for many sectors, not just high tech, media, and entertainment. Cyber security and privacy are part of a constant conversation – guiding innovation in emerging spaces in advance of regulatory concerns, while also dealing with relentless and growing threats.

A mature Postdigital Enterprise™ leverages innovation and drives change. A recent research report identified that 39% of the companies studied exhibited excellence in multiple postdigital domains. On average, these organizations are 26% more profitable than their industry competitors. They generated 9% more revenue through their employees and physical assets, and they exhibited 12% higher market valuation ratios<sup>3</sup>.

In response to this type of advantage, Gartner predicts that by 2015 about 25% of companies will create a Chief Digital Officer (CDO) role, leading digital sources of revenue as well as digital marketplace products and services<sup>4</sup>. This evolution acknowledges that many parts of the business can reap benefits from postdigital convergence. This postdigital environment creates both the opportunity for innovation and the existential threat of disruption – especially now as many businesses are inherently digital. What's at stake may very well be the future of the business. Tomorrow's leading CIOs are likely to be those who rise to the challenge, perhaps reframed as the CDO, forging new identities as a postdigital catalyst – an agent to provoke or speed the move to the Postdigital era.



## History repeating itself?

The evolving nature of IT and the role of the CIO have been the subject of much debate over the past several decades – and a consistent feature of our Technology Trends research. The message has focused on the dual challenge of industrializing core delivery and operations, while elevating the position of IT to help inform the innovation agenda. But practical realities have changed in 2013 – creating not only a sense of urgency, but an opportunity to redefine the role.

	What were the challenges?	What's different in 2013?
<p><b>CIOs as revolutionaries<sup>5</sup></b></p>	<ul style="list-style-type: none"> <li>• Warnings of the declining influence of the CIO had not yet become budget realities, often with the majority of technology spend remaining within the IT department.</li> <li>• Institutional baggage has had an impact, where IT has been saddled with production outages or perceived budget and timeline overruns for discretionary projects. It has been difficult for some CIOs to play an expanded leadership role as they have had to focus on disciplined execution of their baseline mission.</li> <li>• Technology innovations have often not been well understood within the business – leading to lack of enthusiasm for exploring new concepts. Without business sponsorship, many CIOs who have attempted to play revolutionary roles have done so in isolation – trying to anticipate what the business will need, and building what they perceive to be innovative solutions in a vacuum.</li> <li>• Rigid procurement processes and limited technology skills outside of the IT shop provided some incentive to include IT in forward-looking projects; even if CIOs weren't revolutionary in defining the vision, they were often pulled into the effort.</li> </ul>	<ul style="list-style-type: none"> <li>• Analysts predict that, by 2017, the average Chief Marketing Officer (CMO) will spend more on IT than the average CIO<sup>6</sup>. The CIO may no longer just be fighting for recognition, but also for relevance.</li> <li>• Renewed focus on running the business of IT<sup>7</sup>, creating foundational services for efficiency and transparency of the IT function, and creating deliberate disciplines to drive innovation<sup>8</sup>.</li> <li>• Advances in consumer technology and high rates of adoption have created more technologically savvy business counterparts. There is new incentive for the business to participate in innovative IT efforts.</li> <li>• Cloud computing and “app store” platforms have led to more experimentation within the lines of business – with low-code/no-code configuration tools that reduce skill barriers. IT has the chance to insert itself into conversations by providing offerings around security, integration, and data correlation – hurdles that often limit how far “shadow IT” can take potential solutions.</li> </ul>





### Technology implications

CIOs have enormous assets under their control – from applications to infrastructure (including devices, facilities, and operations), from solution sourcing to managing the end-user experience, from planning and demand management to project and financial management. They are also responsible for a large amount of human capital – including full-time, contractor, consultant, on-site, off-site, and off-shore resources.

Becoming a postdigital catalyst is not simply a change in philosophy or mindset. There are a number of tangible implications that should be addressed.

Topic	Description
<b>Budget / portfolio management</b>	Many organizations have a rigid investment process – requiring a well-defined business case and reasonably understood requirements, which are then evaluated at a few predefined times during the calendar year. This often works fine for large ticket, multi-year initiatives like data center modernization or an ERP rollout. But for CIOs to become true postdigital catalysts, they should have a more agile, responsive planning and prioritization function. Project, portfolio, and IT finance management disciplines can help with this journey, adding discipline and visibility around the pipeline of asks, project status, and resource/budget/release performance.
<b>IT delivery model flexibility</b>	Waterfall delivery is an important part of many IT organizations, but what’s good for long-running, widely scoped projects can be anathema for smaller, dynamic efforts. Create a SWAT team with diverse skill sets, including some that may be foreign to your IT department. Think graphic designers, user experience engineers, or even anthropologists and cognitive psychologists, in addition to business leads, technology engineers, QA resources, and project managers capable of cultivating your own flavor of Agile. Business owners respond to show, not <i>tell</i> , in the postdigital world. Cultivate ideas, develop working prototypes with core concepts, and grow your thinking about what is wanted and needed through hands-on experimentation.
<b>Information disciplines</b>	Data management, stewardship, correlation, cleansing, analytics, and visualization can be critical disciplines in the Postdigital era. The “informationalization” of the enterprise should be at the fore of the CIO’s agenda – turning data into decisions, shifting reports into metrics that matter, moving from stove-piped processes to service-based capabilities, and articulating IT’s mission and related services in terms that the business can understand, anchored in business impact.
<b>Integration</b>	Integration and orchestration will likely become the building blocks of tomorrow’s IT organization. A dynamic middle tier is important for managing end-to-end interactions between legacy on-premise packages, rapidly developed emerging technologies, and cloud solutions. Flexibility in terms of service quality, transaction management, the degree of routing determinism, business rules, and policy management will likely be critical.
<b>Vendor management</b>	Technology footprints are trending toward more heterogeneity. Managing contracts, licenses, subscriptions, service levels, updates, patches, and release schedules should be a priority. More strategically, pursuing joint ventures or value-based arrangements with a mix of established players and start-ups can help fuel innovation and hedge against disruption.
<b>Architecture</b>	Architecture and design <sup>9</sup> are the core currency of the Postdigital Enterprise™. While solution architects conversant with business processes and objectives will likely become the most sought after talent, enterprise architecture up and down the stack should be treated as a serious discipline with codified assets.
<b>Enabling skills, methods, and tools</b>	Each postdigital force requires a set of skills, methods, and tools that may or may not be mature in the organization – or even in the market. What are the right mobile app development tools for your needs? As “bring your own device” (BYOD) evolves to “bring your own app” (BYOA), what are the right mobile app management (MAM) and mobile device management (MDM) approaches? Do you have the data science experience for valid taxonomy and pattern discovery that can allow actionable insight from the rising flood of unstructured data? Do you understand the people, process, and technology implications of an increasingly social business environment? What is the right blend of IT services catalog and business services catalog in the hybrid-cloud environment? What are the right methods for digital asset management and cyber intelligent innovation with the intersection – even collision – of analytics, social, and mobile in the borderless cloud? These questions should be addressed as the vendor space evolves with breathtaking speed. This calls for an experimental IT approach, using prototypes and multiple initiatives to find the most appropriate choices in an iterative manner.

## Lessons from the frontlines

### Super-sized innovation

Red Robin Gourmet Burgers needed to boost slumping revenues, connect more efficiently with customers, and revitalize its restaurant business. CIO Chris Laping had already built a reputation as a problem solver, using IT resources to manage complex projects such as improving the company's distributor supply chain. So when the CEO, Stephen Carley, was looking for help to manage organizational change, Laping was named SVP of Business Transformation. IT's track record in meeting tough challenges became a catalyst for driving change in other parts of the company.

To improve customer experience, Laping worked with marketing to leverage the power of analytics. Together, they created the company's loyalty program. The program allows the organization to analyze customer activity – leading to improved insights, tailored marketing communications, and an improved dining experience.

The CIO also sponsored deployment of mobile device management (MDM) software as part of a customer service change initiative, allowing the company to upload applications on tablets shipped to restaurants all over the country. Employees now use tablets to maintain waiting lists and to page customers via their mobile phones when their tables are ready. They also use the tablets to connect customers to their loyalty program.<sup>10</sup>

Laping's vision for business transformation extended beyond customer management to include workforce development. To modernize employee training, a new self-paced, interactive program was rolled out via mobile channels. The company also uses internal social networking to crowdsource feedback from managers and employees across the company. In one early achievement, the time required to roll-out a new menu was reduced from a year-and-a-half to one month<sup>11</sup>.

The CEO recognizes the role of IT as a major driver of innovation for the company, and the efforts of the CIO have translated into increased market share for the company. Profits and stock price have increased, and the company is seeing more repeat customers.

### A winning hand<sup>12</sup>

In the elusive quest for innovation deep in research labs of large corporations, CIOs today have been dealt game-changing cards. IT may have been traditionally known for being risk-averse, but the unfolding of breakthrough business turnarounds led by technology has turned the heads of executives and has them looking to the CIO for the next move. One area of opportunity is developing in the automotive and transportation industry. With the ability to capture and process data from remote train and track sensors and weatherforecasts in real-time, Norfolk Southern Railway has been enhancing its dispatcher decision-making capabilities. Not only is it a cloud play, it's also a big data and analytics one, too.

Using data to automate basic dispatcher decisions, dispatchers and train engineers can spend more time on managing exceptions, moving freight in a timely manner and providing improved service for the company's rail customers. Behind the cards is Deborah Butler, Norfolk Southern's CIO. When fully deployed, the systems are expected to reduce fuel consumption by 6% or more, translating to annual operating cost savings of \$80-\$100 million. Capital investment savings, in the form of reduced asset requirements, could save another \$200-\$400 million.

### Turning trash into treasure

To Puneet Bhasin, Waste Management is not just a garbage company. With more than 22 million customers and 20,000 trucks driving two million miles each day, he describes Waste Management as a logistics and energy company. Bhasin, the company's CIO and SVP of Technology, Logistics, and Customer Service, is working closely with other executives to put technology at the center of the Waste Management network.<sup>13</sup>

When he joined Waste Management, Bhasin's goal was to figure out how the company could leverage emerging technologies. He developed a Decisions Sciences group, now a subsidiary called Waste Management Logistics, to gain insight on operations by using the massive quantities of data the company already had. He worked closely with the CEO and CFO to establish the group, and soon the team was providing data analytics, research, and industrial engineering services. The new capabilities now provide the basis for many new initiatives at the company such as the rollout of custom mobile devices and sensors to trucks to track information such as load weights, routes, and time spent at stops. This allows the company to make routes more efficient, reassign work if trucks become full, and report information back to customers to help them change their trash and recycling habits.

Analytics also forms the basis for a pricing application similar to those used in the airline and hotel industries. Waste Management provides more than 100,000 service quotes a month, specific to each customer<sup>14</sup>. Bhasin determined that salespeople were spending less than half of their time on selling and the rest on administrative tasks such as determining pricing plans. His Decision Sciences group built a predictive analytics model which uses factors such as location, type of waste, weight, local regulations, and competing services to generate price quotes. The application also predicts whether customers with expiring contracts might accept a price increase.

Puneet Bhasin has taken his position as CIO beyond an enabling role to that of a strategic leader, and his vision has put IT at the core of revenue-generating projects. The pricing application, for example, increased revenue by \$218 million in 2010<sup>15</sup>. As Waste Management changes its business, postdigital forces will continue to provide the basis for turning trash into treasure.





## My take

**Doug Albrecht**

Director of Information Management  
Port of Long Beach

At the Port of Long Beach, we help move the nation's goods. My job is to figure out how technology can support this mission effectively in today's postdigital environment. All of the postdigital forces – mobile, analytics, cloud, social, and cyber – are at work at the Port of Long Beach. On the mobile front, smartphone and tablet apps are still emerging for us, but our "mobile first" direction will eventually allow everyone – from executives in Asia to engineers on the job site – to access the Port's systems whenever and wherever. That said, we are pros with mobile sensors and machine-to-machine. We already have many sensor technologies running at the Port: seismologic sensors alert us of earthquakes and potential infrastructure damage, RFID tags control truck access to our terminals, sewer and storm water control sensors measure performance and environmental impact and monitor security.

Sensor data enters directly into our systems and moves all the way up to the analytics for operational dashboards. For example, we receive ship movement data that tracks entry to and exit from the harbor, all integrated with our billing system. The Green Flag Program automatically applies incentive discounts to ships that manage their speed nearing the port, smoothing traffic and mitigating environmental impact. A Green Flag dashboard shows monthly and yearly performance of all carriers calling the Port of Long Beach.

We use a private cloud to get the benefits of business continuity, resilience, and ease of maintenance – even though it creates challenges of complexity and the need for different skill sets. Hardware is a commodity and eventually we will move to a public cloud. I would rather my team worry about Port business than memory needed in a new server.

In terms of social media, we've just begun to use it for external marketing. But internally, a sophisticated project management system connects people and information creating a central source of information for large capital projects, like the \$1.2 billion middle harbor project. We also recently implemented unified communications to facilitate collaboration between our employees. The next step will be to tie it all to mobile.

Cyber security is an imperative. We are part of the U.S. Coast Guard's cyber command center and participate in TSA's Cyber Working Group for the transportation sector. We've implemented a hardened outer shell and deployed multiple in-depth tools and techniques. We also emphasize the "human firewall" by training our employees to understand that no matter how many protections we have, if someone asks for your password and you give it to them, it's all out the window.

I have three pieces of advice for CIOs. First, know what team you're on. I've come to realize that my team at the Port includes both IT and the Directors running other parts of the business. To do my job, I should understand what they're doing, and communicate with them clearly. We invite Port Directors to our IT staff meetings to get to know them and learn how to better support their needs, and build a foundation of trust. Second, develop your people. Teach them leadership, communications, and how the business works. Third, trust your staff to do the work they're supposed to do. That will open up time for you to get out and see what else is going on. Being well-read is important, but not sufficient. It's essential to meet and interact with other IT executives – to bring back ideas that will continue to make postdigital forces more valuable to your business.

### Flying car future

Some predict the slow demise of the CIO<sup>16</sup> – as if IT will become a utility, managed as a distributed function across the business. We predict the opposite. CIOs will likely not only become omnipresent on executive committees, but also become consigliere to CEOs as they navigate an increasingly digital business environment.

Business in the future will likely be conducted as a combination of discrete services – command and control giving way to service levels and outcomes. In this model, outside-in architecture<sup>17</sup> becomes the norm, mandating a platform mentality when building new capabilities. Integration and orchestration of services are more than technical challenges – they may become the basis for market offerings. Social graphs trump organizational structures, computing becomes pervasive and ubiquitous, event-driven replaces process-driven thinking, and experiences may be valued more than fixed processes and predefined standards.

The CIO of the future may look a lot like a venture capitalist – maintaining principles for what makes a solid investment, defining the boundaries upon which deals will be conducted, and driving funding, staffing, and strategic support based on often-changing needs and the emerging value of individual initiatives. Though innovation investments may dominate the portfolio, there will still be a need for care and feeding of the existing operating environment.

Postdigital catalysts are not likely to commoditize operations and maintenance, but rather use it as a feedback loop to guide consistent improvement and more disruptive efforts. How people interact, how business is conducted, and even how the lights are kept on can provide insight.

Finally, completing the shift to postdigital mirrors the shift from a product to an information economy. Much like the CFO manages the capital position of the organization and the Chief Human Resource Officer manages talent, the CIO will likely be responsible for information assets in many forms. This is especially important with the merging of the physical and the digital world, and with the shift to open arbitrage of business IT services. CIOs have had the important elements to the future in their very title. The CIO of the Flying Car Future will likely serve as the evangelist, translator, and arbiter of *information* – not only an important corporate asset, but also the currency upon which dynamic new offerings can be constructed.





## Where do you start?

CIOs should begin with a self-assessment of their relationships with fellow C-suite officers. How is the IT department perceived? Does the head of sales or the CFO have an opinion on the value that IT is creating for the organization? What do they know about the emerging postdigital forces of mobile, social, cloud, analytics, and cyber? What are they doing about them? And, very importantly, how are they engaging with IT to pursue potential benefits?

- **Seed innovation.** Create a pocket within your organization that has goals involving research and development (R&D). This can be heavier “D”, but it is important to explore the five postdigital forces and identify specific ways they can be applied to improve your business. Ask vendors and other business partners to fuel the ideation – not with abstract rhetoric, but with real examples with tangible outcomes. Find use cases that make the concepts real, regardless of industry or sector alignment. Innovation is just as much about the import/export flow of ideas than the “eureka” moments. Nurture the discovery of these potential catalytic possibilities.
- **Have essential conversations.** Sit down and talk with each functional head. Understand their priorities, solicit feedback on your organization, and start a dialogue about the potential of the postdigital forces based on real-world stories you’ve uncovered. Find out if they’ve started dabbling in any of the areas – even at the conceptual level. Acknowledge the need for a different operating and delivery model in these new spaces.
- **Retool.** Few IT organizations are equipped to transition to the Postdigital era. Increased depth in both business and technical skills will likely be required, with a different mentality about what is possible, and what new techniques are needed to deliver on the possibilities. Focus on business and technical architecture, creating expectations for both specialization and a broader understanding across solution touch points and the entire delivery lifecycle. This new world will likely require the close teaming of people with a wide range of skills, so grow your postdigital innovation team with that expectation in mind. Use it to guide hiring, facilities build-out (the physical space they’ll be working in matters), and methodologies for planning and delivery.
- **Prototype.** Commit to expediting concept development using your modified approach. Ground projects in business objectives and simple metrics. Fight for a single, empowered business owner who can guide both the big picture direction and the tactical decisions of the project. Create a cadence of releasable code every few weeks – even if many of the incremental sprints will likely never be widely distributed. Pilot as soon as possible, using user feedback to guide the future direction of the solution. Adopt the mantra of plan big, start small, fail fast, and scale appropriately. Rinse and repeat – adding additional domain areas across lines of business, and building towards more ambitious improvement initiatives.



## Bottom line

It is the best of times. It is the worst of times. There has likely never been more potential for the CIO to shape business performance and competitive stance. The collision of the five postdigital forces creates complexity along with opportunity. Innovation can start with ERP. Combine analytics, mobile, and social for new triple-threat potential. Cloud allows marginal investment experiments with substantial business value. Cyber is important for risk-intelligent innovation. Pressures to deliver value persist. IT departments that aren't seen as reliable, efficient, and effective will likely be relegated to utility status.

The CIO can lead the move to tomorrow, reshaping business as usual, and driving innovation. When CIOs catalyze the convergence of the postdigital forces, they can change the conversation from systems to capabilities and from technical issues to business impact. Plan big, start small, fail fast, scale appropriately.

## Authors

### Suketu Gandhi

Principal, Deloitte Consulting LLP  
sugandhi@deloitte.com

With over 19 years of experience in the IT arena focusing on “consumer-driven businesses,” Suketu leads the IT Strategy & Management service line in the Global Technology Advisory practice and the Postdigital Enterprise™ market offering, focused on provoking and harvesting the disruption of the five postdigital forces.



### Bill Briggs

Director, Deloitte Consulting LLP  
wbriggs@deloitte.com

Bill Briggs is passionate about disruptive digital technologies. In his roles as Global lead of Deloitte Digital and deputy Chief Technology Officer of Deloitte Consulting LLP, Bill combines deep technology implementation experience with a farsighted view of the evolving technology landscape.



## Endnotes

- <sup>1</sup> Source: Deloitte Consulting LLP proprietary research conducted by the Deloitte Global Benchmarking Center, 2012.
- <sup>2</sup> Gartner, Inc., “CFOs’ Demand for IT: 2012 Gartner FEI Study,” John E. VanDecker, October 19, 2012.
- <sup>3</sup> George Westerman, Maël Tannou, Didier Bonnet, Patrick Ferraris, and Andrew McAfee (2012). *The Digital Advantage: How digital leaders outperform their peers in every industry*. Published by the MIT Center for Digital Business and Capgemini Consulting. Retrieved from <http://sloanreview.mit.edu/offers-digital-transformation-2012/>.
- <sup>4</sup> “Gartner Says Every Budget is Becoming an IT Budget,” Gartner, Inc. press release, October 22, 2012, on the Gartner, Inc. web site, <http://www.gartner.com/it/page.jsp?id=2208015>, accessed December 7, 2012.
- <sup>5</sup> 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 4.
- <sup>6</sup> Todd Wasserman, *Why Are B2B Social Media Firms So Hot?*, <http://mashable.com/2012/06/20/why-enterprise-social-media-firms-are-being-gobbled-up/> (June 2012).
- <sup>7</sup> Additional information is available in Deloitte Consulting LLP (2013), “Tech Trends 2013: Elements of postdigital”, [www.deloitte.com/us/techtrends2013](http://www.deloitte.com/us/techtrends2013), Chapter 10.
- <sup>8</sup> Additional information is available in Deloitte Consulting LLP (2012), “Tech Trends 2012: Elevate IT for digital business”, [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 9.
- <sup>9</sup> Additional information is available in Deloitte Consulting LLP (2013), “Tech Trends 2013: Elements of postdigital”, [www.deloitte.com/us/techtrends2013](http://www.deloitte.com/us/techtrends2013), Chapter 5.
- <sup>10</sup> David F. Carr, *Red Robin CIO Named Social Business Technology Leader*, <http://www.informationweek.com/thebrainyard/news/240012564/red-robin-cio-named-social-business-technology-leader> (October 31, 2012).
- <sup>11</sup> David F. Carr, *Red Robin CIO Named Social Business Technology Leader*, <http://www.informationweek.com/thebrainyard/news/240012564/red-robin-cio-named-social-business-technology-leader> (October 31, 2012).
- <sup>12</sup> King, R. *GE CEO Jeff Immelt Says Analytics ‘Next Holy Grail’*. Retrieved December 29, 2012, from <http://blogs.wsj.com/cio/2012/11/29/ge-ceo-jeff-immelt-says-analytics-next-holy-grail/>
- <sup>13</sup> Peter High, *CIO-plus Series: Interview with Puneet Bhasin of Waste Management*, <http://www.forbes.com/sites/peterhigh/2012/11/26/cio-plus-series-interview-with-puneet-bhasin-of-waste-management/> (November 26, 2012).
- <sup>14</sup> Chris Murphy, *Waste Management Software Helps Find The Right Price*, <http://www.informationweek.com/global-cio/interviews/waste-management-software-helps-find-the/231600963> (September 14, 2011).
- <sup>15</sup> Kim Nash, *New Mission for CIOs: the Art and Science of Pricing*, [http://www.cio.com/article/697992/New\\_Mission\\_for\\_CIOs\\_the\\_Art\\_and\\_Science\\_of\\_Pricing\\_?page=1&taxonomyId=3151](http://www.cio.com/article/697992/New_Mission_for_CIOs_the_Art_and_Science_of_Pricing_?page=1&taxonomyId=3151) (January 10, 2012).
- <sup>16</sup> Peter Kretzman, *IT Consumerization, the Cloud and the Alleged Death of the CIO*, <http://www.wired.com/insights/2012/03/death-of-the-cio/> (March 2012).
- <sup>17</sup> Additional information is available in Deloitte Consulting LLP (2012), “Tech Trends 2012: Elevate IT for digital business”, [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 10.





# 2 Mobile Only (and beyond)

## Apps are just the beginning

A bevy of statistics triumphantly proclaim the arrival of the mobile era – from Internet traffic statistics to device sales to even broad measures of how people spend their time:

- In 2012, both Apple<sup>1</sup> and Google Play<sup>2</sup> surpassed 25 billion app downloads
- As of September 2012, Square is processing \$8 billion on an annualized basis, up from \$1 billion a year ago<sup>3</sup>, and 35 million Americans have completed purchases using Square<sup>4</sup>
- A survey of Web-enabled phone owners found that 80% of the participants multitasked on their mobile device while watching TV<sup>5</sup>
- As of December 2012, 13% of all Internet traffic originated from mobile devices<sup>6</sup>
- In the second quarter for 2013, the total global install base of smartphones and tablets is predicted to exceed those of PCs<sup>7</sup>

The explosion of smartphone and tablet adoption in the consumer world cannot be denied. And enterprises have taken note. Mobile initiatives have popped up in almost every corner of the business – looking to untether the workforce, engage customers more effectively, and reshape business-as-usual. CIOs are scrambling to deal with the outcry. To manage, maintain, connect, and protect devices. To imagine, build, deploy, and promote applications. And all the while, many are singing the gospel of “an app for that,” trying to close the gap between end-user expectations and current offerings.

Against this backdrop, “mobile first” became a rallying cry in 2012, calling for each project, solution, or investment to strongly consider a mobile component. That’s where many companies stand today: wrestling with how to use mobile – specifically smartphones and tablets – to veneer existing operations and processes. Unfortunately, it’s been slow

going. Our research shows that across the *Fortune 100*, only 62% of companies have some kind of publicly available app. Even fewer, 52%, have mobile-oriented websites (that is, a mobile-specific site with a dedicated URL, such as *m.url.com* or *url.com/mobile*).<sup>8</sup>

But things are changing, with the mobile ecosystem moving at lightning speed. Smart phones and tablets aren’t the only – or sometimes even the preferred – targets. Advances in embedded sensors and actuators are driving powerful machine-to-machine (M2M) use cases. Pattern recognition and contextual analysis, ambient access and connectivity, and mass adoption of natural user interfaces – voice, gesture, and beyond – are creating new modes for user engagement. The opportunity goes well beyond using mobile apps to do what you’ve always done differently. It’s about doing fundamentally different things.

We’re entering an era of “mobile only,” with outcomes that would be impossible without today’s mix of persistent connectivity, artisanal solutions that blend creativity and UX and next-generation engineering with devices. Uber, Square, and Project Glass would not exist without mobile. Neither would Whole Foods’ robotic shopping carts – which double as concierges and personal, in-aisle checkout machines. As the cost of Bluetooth chipsets and WiFi continue to drop, suddenly it seems *everything* has the potential for intelligence – either as a stand-alone device or by tethering to a phone, tablet, or PC.

In the post-PC era, mobile can’t be just a hobby. It’s not noteworthy that your enterprise has great mobile apps; it’s noteworthy if you don’t. As you move past experimentation, make sure you avoid getting stuck on mobile first. Focus instead on the prospect of reinvention, based on the new realities of *Mobile Only – and beyond*.

### History repeating itself?

We're still in the early days of the mobile era. Deloitte research shows that leading mobile operating systems are less than five years old, and enterprise adoption has only just begun<sup>9</sup>. IT professionals are barraged with hype from vendors and talking heads eager to announce the arrival of a new age. Coming in the wake of incessant cloud rumblings, discerning CIOs are wary of getting too far ahead of mobile's intended promise.

	What were the challenges?	What's different in 2013?
<b>"Web era" hype</b>	<ul style="list-style-type: none"> <li>• "E" everything became the rule, as vendors saturated the market with retooled solutions to take advantage of the Web. Marketing over-sold products with marginal business value and unsophisticated technical architectures.</li> <li>• Web was approached as its own, independent domain – organizationally, technically, and operationally. As adoption hit maturity, the distinction became meaningless. eCommerce was simply another channel and business was inseparable from eBusiness. Organizations were left trying to integrate web divisions back into the fold.</li> <li>• The switch from thick clients to web presence was an important shift, but it still largely focused on desktops and laptops with broadband connectivity. The result was only a modest effect on the nature of technology services, or the types of problems that could be addressed.</li> </ul>	<ul style="list-style-type: none"> <li>• While a land grab is underway across mobile, there has been a remarkable amount of standardization on platforms and services. From OS to micro-blogging to social sharing to location-based recommendation services, a handful of dominant players have emerged in each market. And while the futures of individual vendors are far from certain, the services they provide and the use cases made possible will likely continue to thrive – providing a foundation for innovating beyond today's definition of mobile.</li> <li>• Mobile will likely become a solution fabric, like the Web – present in almost every part of a business. And because mobile centers of excellence are introducing multi-disciplinary, Agile-based solution approaches, their usefulness will likely extend beyond the shelf-life of mobile's novelty – and should be easily shifted to the next emerging technology. Companies are learning from their e-mistakes, thinking about omni-channel sales, logistics, and marketing instead of domain silos.</li> <li>• Mobile's impact on business can be even more radical than the Web's – removing physical boundaries as to where business can occur and who can conduct it.</li> </ul>
<b>Asset intelligence / "Internet of Things"</b>	<ul style="list-style-type: none"> <li>• Sensor and embedded-chip pricing historically had not hit a tipping point allowing mass market adoption.</li> <li>• RFID backlash and uncertainty around NFC adoption slowed corporate investment – exacerbated by competing protocols<sup>10</sup> and visible lack of support<sup>11</sup> from industry leaders.</li> </ul>	<ul style="list-style-type: none"> <li>• Recent roll-out of next-generation printable tags and low cost/footprint components is making widespread adoption feasible.</li> <li>• Sector-specific innovation is short-circuiting adoption cycles. mHealth advances by conventional consumer goods companies (e.g., Casio, Jawbone, Nike) and new entrants (e.g., AgaMatrix, FitBit, Vitality) are creating new standards – and encouraging a growing population of niche players that are innovating on top of their platforms.</li> </ul>

## Technology implications

Many CIOs don't need convincing on mobile. They understand that its potential is only beginning to be unlocked, and they're excited about the chance to play corporate Prometheus – bringing emerging technologies to the business to spark innovation.

But they're also dealing with the complications of even today's modest mobile adoption: bring your own device (BYOD) pressures from line employees to the boardroom. Draconian restrictions around security, risk, and legal by the Chief Information Security Officer (CISO) and general counsel. Constituencies that are long on app ideas (some good, some great, some awful). And an IT organization that is ill-equipped to deal with the tsunami. Thankfully, the same building blocks needed for the tactical response can likely be re-used once the business embraces *Mobile Only – and beyond*.

Topic	Description
<b>Security and privacy</b>	<p>Organizations need policies and tools: To authenticate users. To control devices, applications and data. To provide end-to-end encryption while at rest, in flight, and in use. To run content filtering and malware protection. To allow security event monitoring, logging, and response. Security policies and profiles should be tied to specific users and plausible scenarios, focusing remedies on likely incidents, not the infinite range of imaginable risks.</p> <p>Privacy is a universal concern – from industry regulations, to legally protected information, to sensitivity about inappropriate monitoring of behavior and social interactions. Industry-leading practices should be merged with organizational policies and governance to address today's regulatory needs. Some very real technical design considerations unfold, including how to present, cache, and store personally identifiable information (PII) and transactional data to comply with the Payment Card Industry (PCI) Data Security Standards, HIPAA (Health Insurance Portability and Accountability Act), and others.</p>
<b>Mobile device management (MDM)</b>	<p>MDM is an important dimension of security and privacy, allowing organizations to manage and control devices – especially as the definition of “device” grows beyond phones, tablets, and laptops. MDM allows for policies, provisioning profiles, apps, and data to be enforced, monitored, and protected. Patches, software (OS/app) updates, and automatic back-ups can be executed over the air.</p> <p>MDM can also allow devices to be triaged, disabled, or wiped clean if compromised. Mobile OS providers are trying to build more detailed management tools into their platforms – but with a crowded vendor landscape there will likely be consolidation in the coming year.</p>
<b>Digital content management</b>	<p>Mobile is forcing renewed attention on digital content, asset, and rights management – and downstream activities of monitoring, measuring, and analytics. “Multi-channel” mandates are maturing into “omni-channel” strategies – requiring consistency and completeness across whatever means of interaction a customer chooses. Content is at the heart of the experience, and is increasingly interactive, high resolution, and dynamically allocated based on customer and location context.</p>
<b>Mobile architecture</b>	<p>Native, responsive Web, and hybrid (Web views within native app containers) application architectures currently dominate. But a new generation of cross-platform development tools have “build once, deploy many” and “low/no code” approaches. Many organizations will need to support a combination of these techniques, with appropriate choices being driven by business objectives and usage scenarios. But remember, the underlying data and services layers are just as important. Mobile middleware is an extension to many existing integration solutions, improving message delivery by parsing/buffering large data payloads and allowing for offline transaction processing.</p>
<b>Mobile QA</b>	<p>The end-user experience is king in mobile, and mobile QA should reflect that attitude. A baseline of automated scripting is encouraged – with compilation and build-verification addressing compatibility issues with the target device portfolio. This portfolio is likely to expand. Edge-case testing simulating connectivity and usage parameters of the end user are also necessary – validating graceful feature degradation as signals lose strength, traumatic event handling if devices are dropped, and inadvertent interaction (e.g., “pocket dialing” equivalent for apps).</p>
<b>Mobile center of excellence</b>	<p>Many organizations are approaching mobile with a non-traditional delivery model – embracing Agile methodologies using a multi-disciplinary team with unconventional skills such as creative directors, graphic designers, and user experience engineers. Regardless of consumer- or employee-facing scope, rapid development with a heavy emphasis on usability and design are needed – neither of which is a core discipline for many enterprise IT shops. Mobile and, more broadly, digital centers of excellence, are becoming commonplace, helping to bridge the historical divide between the CMO and CIO organizations.</p>

## Lessons from the frontlines

### Leave your wallet at home

Square is an electronic payment company that enables a mobile-only payment experience, where the customer can make a payment from the “wallet” app on his or her smartphone – and the vendor can process payments using the “register” app on a smartphone or tablet. In addition, when both customer and cashier are using the apps, the cashier can detect the customer through location-based technologies. In that case, all the customer needs to do is say his or her name to complete the purchase. No more fumbling for change, digging through credit cards, or even picking up your smartphone. Making a payment can become hands-free.

Businesses that didn’t accept credit cards before can now take advantage of the millions of cards that Americans carry – vendors at flea markets, mom-and-pop shops, artists, farmers’ markets, and more. And beyond the “cool factor” of paying with a smartphone, customers can use Square to give and receive gift cards and earn rewards points for their purchases. With Square, customers can truly leave their wallets at home.

### Collaborative Care<sup>12</sup>

The New Media Medicine research group at the MIT Media Lab has been using mobile to disrupt the health care industry and reinvent the doctor-patient relationship. Using CollaboRhythm, an open-source technology platform the group created, patients with chronic diseases are empowered to become apprentices and active participants in their own health, and doctors and other health professionals are converted into real-time coaches.

Interaction with CollaboRhythm begins with a speech- and touch-controlled interface that enables doctors and patients to make shared decisions about care. It’s not a tele-presence system, but a tele-collaboration system. CollaboRhythm provides patient data tracking interfaces, data synchronization services, communication tools, and visualization frameworks, and makes it easy to deploy applications to mobile phones, tablets, and computers. The goal is for patients to own their health data and track their own progress so they can take appropriate action – with doctors serving as health coaches instead of commanders. Using CollaboRhythm, many things that patients would see in their doctors’ offices is available at home – or when patients visit another doctor, or change jobs, or move across the world. And, patients can contribute their own data that doctors often do not see: data points and perceptions about social support, diet, alternative therapies, and how these factors influence their quality of life. What could this mean? No more letting patients slip through the cracks.

The research group has already thought about how to take CollaboRhythm to the next level. In the not-so-distant future, doctors could push medication reminders to a patient’s bathroom mirror or television. Or, patients could talk with an “intelligent conversational agent” to prepare for a visit to the doctor. Doctors could even send patients visualizations of their health progress in fighting disease, in a way that’s both understandable and actionable for patients.

The New Media Medicine group believes that patients of the future will likely know more about their health than their doctors. And by making patients active and informed contributors to their own care, patients can be healthier and in control. And, as patient wellness is likely to become an important factor in the profitability of the health care system, this is likely to be something that life sciences companies, providers, and plans are incented to promote.

### Hardware renaissance: thy name is mobile

Kickstarter is a popular crowd-sourced venture capital platform. Two of its milestone projects embody the Mobile Only mindset. Tik Tok was the first company to raise nearly \$1 million<sup>13</sup>, selling watchbands to hold Apple’s Nano 6. Even with a relatively sparse set of features, the idea of a smart watch captured imaginations, selling 250,000 units through May 2012<sup>14</sup> and sparking a new niche industry. Pebble Watch is Tik Tok’s spiritual, if not literal, successor, featuring an e-ink display and Bluetooth 4.0 connectivity to smartphone devices. Caller ID, incoming text messages, notifications, weather, and other app-specific content are delivered on the wrist. Buttons and touch screen prompts allow interaction with the devices: answering the phone, launching voice commands, etc. And with its own software development kit (SDK) and app marketplace, new features are being rolled out daily.

Finally, Smart Things moves beyond wearable computing, looking to imbed intelligence into many things in your life with an affordable range of sensors, actuators, and hubs. Not surprisingly, a smartphone app is included for manual control. Possibly its most intriguing feature is its rules engine and open SDK – allowing complex events to be modeled and executed based on chains of sensors and controllers. For example, location triggers on a phone can trigger a “leaving home” event, causing doors to lock, thermostat to be adjusted, lights to be turned off, and security devices to be initiated.



# My take

## Larry Quinlan

Global Chief Information Officer  
Deloitte Touche Tohmatsu Limited

On a recent family vacation, my daughters and I rented jet skis. And I noticed something: our entire rental process was mobile-enabled. The operator scheduled our equipment, swiped my credit card, and even issued a receipt from his mobile phone – and I later learned that he uses his mobile phone to arrange for maintenance too. This is just one example that “mobile only” is a trend that is here to stay. It’s changing the way we operate in both our personal and professional lives.

At Deloitte, we have a five-pronged approach to take advantage of the mobile trend. The first prong is hardware: you can’t be mobile without devices. Companies take various approaches, from “everyone will get the same device – and you’re going to like it” to “bring your own device to work, whatever it is, secure or unsecure.” We opted for an approach in the middle. Once a mobile device passes our security testing, we believe in offering it as a choice.

The second prong is device management. In what we believe is in the best interest of our people and clients, we’ve chosen a tightly-managed approach, but without adopting a single, heavy mobile device management application.

The third prong is our software. How do we feel about tablet, PDA, and multiplatform software? We did some experimenting to figure this out. There are many amazing apps out there, but at Deloitte, we have to tune to the business imperative. We have an enterprise app store, and we’re now globalizing it to unify our software experience.

The fourth prong in our approach is collaboration. We fundamentally believe that mobile is a critical enabler to improve collaboration with one another. We’ve started using a web conferencing solution that allows us to join web conferences from our tablets and smartphones in addition to our laptops. Mobile web conferencing helps us not miss a beat with our teams and clients even when we’re on the go.

And the last prong is handling the unknown answer to the question of “what’s next?” Can we radically improve a business process, like the jet ski operator working in a way that he couldn’t before? Will mobile help us deploy our people? Manage skill sets? Write proposals? Maybe it’s not revolutionary, but what if we could use mobile to manage office space? Monday through Thursday our offices are virtually empty, yet on Friday you can’t find a seat. What if our badges acted as real-time sensors to improve management of our space, and ultimately saved tens of millions of dollars?

How do we measure our achievement? We’re in the people business, so improvements in productivity provide us with a competitive advantage – but the impact is hard to measure. However, consider this: today, if you land after a six-hour flight and have 89 messages in your inbox, by the time you get through Customs, you’ve cleared most of them. Before mobile, you’d have had to get to the hotel and fire up your laptop, and spent your night on those 89 emails. It’s hard to argue that mobile doesn’t improve productivity.

Many CIOs, myself included, like to be in control. But with mobile, my advice is to not try to control it completely. Consider an experimental approach to developing apps – it will likely teach you something. Listen to your people, and get an improved understanding of how they are using mobile. Build prototypes, get feedback, and throw them away. This is hard to embrace, since nobody has ever said “let’s implement an ERP system, see what it does for us, and scrap it next year.” But mobile brings the need for a different approach.

Ultimately, success is when technology supports the way we inherently do our jobs, so we need to figure out how to tie mobile back to our fundamental business processes. When we can finally affect business processes with mobile in a way that makes people say “Wow, I never thought of that!”...we’ve done our job.

### Flying car future

We are already living on the cusp of mobile's future. Mobile and mobility are converging in the form of self-driving cars, now legal in three U.S. states<sup>15</sup>. Digital wallets are delivering on the holy grail of a singular digital identity crossing our personal and professional personas. Society is trending towards connectivity and some form of computing embedded in almost everything around us, which we're interacting with in more and more natural ways. Four forces are taking shape, defining the new face of mobile:

- **Convergence.** Mobile will likely become the anchor of our digital identities, providing a centralized, connected, always-with-us hub for services, information, entertainment, and convenience across our personal and professional lives. Impulse computing is moving from luxury to the very fabric of how we interact with the world around us. Mobile is already the new camera, watch, book store, radio, car key, dictionary, textbook, address book, medical health record, sales tool, cash register, daily planner, calculator, customer service agent, thermostat, and personal assistant. How long before it also becomes the new doctor, personal historian, retail store, personal manufacturing line (3D printing and replication), and official proof of identity? More compelling than the individual use cases is how they'll converge in a mobile footprint accessible across different devices, as our definition of device evolves from a discrete piece of electronic equipment to a collection of participating nodes.
- **Ubiquity.** Virtually everything and everyone we interact with will likely soon have the potential to be wired – containing embedded sensors and mobile technologies that allow new and advanced tracking of and interaction with physical things. Portability of the ever-growing list of converging services will likely be expected. Sync almost any activity across almost any device. Begin reading the morning paper in your bathroom mirror and continue by listening to the text-to-voice version from the dashboard of your car during traffic stops. Then finish through the heads-up display from your glasses on the elevator ride to your office.

- **Transparency.** The user interface is evolving. We've already moved from point-click-type to touch-swipe, but we're still consciously interfacing with a device. Voice, gesture, and location-based services are likely to become the primary modus operando – unlocking new use cases for commerce, back-office, and personal lives. A simple example is a mobile boarding pass for an airline flight. Until recently, a user had to take her phone out, unlock the device, open her calendar, find her flight, copy her confirmation code, find and launch the airline's app, choose check-in, paste her confirmation detail, and then stay in the app to present the boarding pass at security and again upon boarding. Using location-based services and a host of technologies for short-range communication, today's devices can make the operation a user-free interaction. When the user arrives at the airport within three hours of a flight on her calendar, the boarding pass is automatically displayed on her screen and transmitted to the TSA and gate agents without her having to take the device out of her purse.
- **Extending reality.** Augmented reality is moving out of games and military and scientific environments into the mainstream enterprise. What you can read, hear, or feel is delivered based on how you gesture, move, and talk – sensitive to location and context, with information you need or want in a format that can adapt to the environment at hand. The defining developmental work of Sixth Sense from Pranav Mistry and Patty Maes in the MIT Media Lab's Fluid Interfaces Group demonstrates that this is not science fiction – but rather business reality<sup>16</sup>.





## Where do you start?

Many companies find themselves off to the mobile races – with efforts launching across business units and across functions around the globe. Prioritization and focus remain critical, but just as important is a bold vision to think beyond veneering today’s business and processes. This puts even more pressure on the enterprise enablement front – how to secure, build, integrate, deploy, and manage a new set of devices, services, and assets that are necessarily dynamic. Even in this changing world, there are some foundational steps that many early achievements have followed.

- **(Accelerated) digital strategy.** Mobile is moving too fast for a prolonged academic exercise in strategic planning. Make no mistake – strategy is important. But it should happen in eight weeks instead of eight months. It should begin with opportunity identification – helping the business discover ideas for reshaping customer, employee, product, and partner experience through mobile. And don’t forget about enablement – creating a roadmap for just enough foundational architecture, infrastructure, and management capabilities to be slightly ahead of the usage scenarios.
- **Cross the streams.** Is your organization funding parallel efforts in content management, asset management, social, CRM, analytics, gamification, and mobile? If so, you’re not alone. At best, there’s redundant work being done. At worst, connections are being missed, and competing priorities may be leading in drastically different directions. These efforts don’t necessarily have to be corralled under a single centralized team, though they increasingly are. But there are enough real dependencies and overlap that they can’t be handled in isolation, either.
- **Lessons from kindergarten.** Mobile is begging for show, not tell – especially as you start dabbling with advanced features. Even your most creative end users are subconsciously anchored in how things work today. You need to bring concepts to life – whether through illustrated user stories or wireframes or working prototypes. Create a mobile ‘A-team’ with a mix of talents that include creative, UX, engineering, and sector and functional knowledge. Consider starting by deciding on a target platform and have them come up to speed. Let them earn their stripes on a particularly juicy use case with clear business value. Also, consider using them as the inner circle of your mobile center of excellence – guiding choices as mobile moves from an experiment to a core strategic discipline.

- **Eat TechCrunch for breakfast.** Inspiration is likely due more to the importing and exporting of ideas than to “eureka” moments of radical breakthroughs. Who in your organization is monitoring the start-up community and technology blogosphere for anecdotes that may seed your next big thing? Especially in mobile, use cases are remarkably portable across industries. Consider making team members accountable for staying current on what others are doing. Create social platforms for the broader organization to engage around these potential sparks – with the added benefit that ideas and commentary will likely not dissipate into the ether of isolated inboxes, but instead will remain persistent assets whose value may not be unveiled for some time.
- **User down, not system up.** Meeting user expectations starts with research and data-driven inquiry to understand the target users’ needs, desires, and routines. These insights drive the early-stage strategy and feature ideation process. Because customers interact with companies through a variety of touchpoints – from browsing a website to calling a customer service associate – it’s important to consider each interaction through the eyes of the customer.

For an airline, that may mean grounding features and functionality in the realities of the pilot and attendant experience, from pre-departure workflows to in-flight limitations such as low lighting and turbulence. For a distributor, it may mean weighing the needs of the business with the on-the-ground needs of drivers. And for a railroad, it may mean opportunities to help conductors overcome the distractions of a moving train with customizable font sizes, expanded touch areas, and a task-focused architecture.





## Bottom line

Mobile is more than just the latest step function in tech innovation. It is a fast-moving engine that is fundamentally reshaping operating models, business models, and marketplaces. The start-up and venture communities have embraced this notion – but the *Fortune 100* have been slow to react. Organizations should move boldly to establish themselves in the mobile era – and be prepared to ride the tsunami as it evolves. Those who do not may be left behind in its wake.

## Authors

### Mike Brinker



Principal, Deloitte Consulting LLP

mbrinker@deloitte.com

For two decades, Mike Brinker has been helping clients navigate the ever-changing world of technology. His deep insights and experience enable Mike to understand the particular needs of a client's business, develop practical business solutions and bring change that can produce results.

### Shehryar Khan



Principal, Deloitte Consulting LLP

khans@deloitte.com

As the mobile lead for the Deloitte Digital service line, Shehryar Khan focuses on helping clients use mobile to drive organizational transformation – identifying opportunities where mobile can truly impact both user and business goals.

## Endnotes

- <sup>1</sup> "Apple's App Store Downloads Top 25 Billion," Apple Inc. press release, March 5, 2012, on the Apple Inc. web site, <http://www.apple.com/pr/library/2012/03/05Apples-App-Store-Downloads-Top-25-Billion.html>, accessed December 6, 2012.
- <sup>2</sup> Velazco, C. *Google's Play Store Hits 25 Billion App Downloads, Kicks Off Five Day Sale To Celebrate*. Retrieved December 6, 2012, from <http://techcrunch.com/2012/09/26/google-play-store-25-billion-app-downloads/>
- <sup>3</sup> Kim, R. *Square goes big: raises \$200m at \$3.25b valuation*. Retrieved December 6, 2012, from <http://gigaom.com/2012/09/17/square-goes-big-raises-200m-at-3-25b-valuation/>
- <sup>4</sup> Tofel, K. *Future of mobile: 5 takeaways from Mobilize 2012*. Retrieved December 6, 2012, from <http://gigaom.com/mobile/future-of-mobile-5-takeaways-from-mobilize-2012/>
- <sup>5</sup> Jeremy Lockhorn, *Forget Mobile – Think Multiscreen*, <http://razorfishoutlook.razorfish.com/articles/forgetmobile.aspx#01>, accessed December 6, 2012.
- <sup>6</sup> Mary Meeker, *2012 Internet Trends*, <http://kpcb.com/insights/2012-internet-trends> (May 30, 2012). Slideshare
- <sup>7</sup> Mary Meeker, *2012 Internet Trends*, <http://kpcb.com/insights/2012-internet-trends> (May 30, 2012). Slideshare
- <sup>8</sup> Deloitte Consulting LLP proprietary research, September 2012.
- <sup>9</sup> Deloitte Consulting LLP proprietary research, October 2012.
- <sup>10</sup> Charlie Fine, Natalie Klym, Milind Tavshikar, and Dirk Trossen, *The Evolution of RFID Networks* (Paper 224), [http://ebusiness.mit.edu/research/papers/224\\_Fine\\_Klym\\_Evolution\\_of\\_RFID\\_Networks.pdf](http://ebusiness.mit.edu/research/papers/224_Fine_Klym_Evolution_of_RFID_Networks.pdf) (May 2006).
- <sup>11</sup> Kim, R. *iPhone 5's NFC snub will keep technology out of mainstream*. Retrieved December 6, 2012, from <http://gigaom.com/2012/09/12/iphone-5s-nfc-snub-will-keep-technology-out-of-mainstream/>
- <sup>12</sup> See: <http://newmed.media.mit.edu/collaborhythm>
- <sup>13</sup> See: <http://www.kickstarter.com/projects/1104350651/tiktok-lunatik-multi-touch-watch-kits>
- <sup>14</sup> Laurie Segall, *\$7 million Pebble watch shatters Kickstarter records*, <http://money.cnn.com/2012/05/02/technology/startups/pebble-kickstarter-watch/index.htm> (May 2012).
- <sup>15</sup> Thomas Claburn, *Google Autonomous Cars Get Green Light In California*, <http://www.informationweek.com/government/policy/google-autonomous-cars-get-green-light-i/240008033> (September 27, 2012).
- <sup>16</sup> See: <http://www.pranavmistry.com/projects/sixthsense/>



# 3

## Social Reengineering by Design

### Shaking off the business constraints of 19<sup>th</sup> century platforms

Modern corporations owe their structure and operating models to the birth of the industrial age, where bureaucracy, hierarchy, and specialization of labor were paramount for efficiencies and scale. Clearly defined roles and responsibilities, strict processes, and a “C3” (command, control, and communications) mentality are tenets of the model prescribed by Max Weber, adjusted by Henry Ford, and refined by Michael Hammer.

Many businesses have found success in the model. But current business practices constrain individual responsibility, accountability, and capability. Sometimes that’s due to real or perceived boundaries of a specific job. Often it’s because people are simply unable to navigate the organization – find the right information, specialists, or decision makers to grow ideas, build relationships with people with similar interests, or effectively work together in a multinational, matrix reporting environment.

Compare that with the intended goals of social business<sup>1</sup>: to amplify individual passions, experience, and relationships for the benefit of the enterprise – invisible connections and characteristics within the physical manifestation of our organizations. Aligning the interests of the individual with the mission of the business and every other employee, while harnessing universal qualities of individual worth: content, authenticity, integrity, reputation, commitment, and reliability.

The real potential of social business involves breaking down barriers that limit human potential and business performance. But it requires fundamentally rethinking how work gets done and how value is created in the Postdigital era – social reengineering of the business.

The strategies, practices, and technologies of social business are maturing. No longer viewed as a fad or a distraction, different parts of many organizations are

already realizing the potential. Marketing and public relations have established listening posts to track consumer sentiment in the public social sphere. Sales and customer service are integrating customer contacts across channels and connecting with R&D, manufacturing, and fulfillment. Customer command centers move beyond passive monitoring, using social channels to actively engage with personalized outreach, promotions, issue triage, and product support. CIOs have initiatives underway to give employees social tools for collaboration, finding and mining the knowledge of the enterprise, and creating new intellectual property assets with a more enlightened, user-centric approach to knowledge management.

While this is progress, it is only the beginning of what’s possible. Many companies are stuck on “what social media and social technologies should I deploy, and how can I get my people to use them?” They’ve adopted the pattern of starting with a new social tool, bolting it onto existing processes, and hoping for a desired result. This approach may improve, but it does not transform.

Instead, reexamine your process automation designs (ERP) and your information automation designs (analytics) to seize the value afforded by a truly, transparently connected enterprise. Where in those designs are there assumptions of isolated specialization? Of limiting linear transactional processes? Of limited flow of information and context for decision and action? Of same-time, same-place requirements for employee productivity and capability? Where are the processes and systems constrained by traditional C3 – command, control, and communications? Where can you relieve organizational and process barriers to give customers, teams, and suppliers social collaboration, communication, and monitoring tools to help them perform? How can you empower people to transcend the limits of the pre-defined processes to do the right thing and maximize the value of each interaction? Realizing the potential of social reengineering isn’t a “project.” It’s a strategy. And it’s not serendipity. It’s intentional – by design.

### History repeating itself?

Social reengineering is predicated on social business – which is still often confused with similar sounding, partially related terms such as social media, social networking, and social computing. But beyond that, the concept of rewiring organizations based on technology draws comparisons to the ERP revolution of the 1990s. But this is more than BPR2.0, so what is different about social reengineering?

	What were the challenges?	What's different in 2013?
<b>Social business / social network/social media</b>	<ul style="list-style-type: none"> <li>• There has been a lack of clarity around the definition of these concepts – which has caused misperceptions and less-than-impactful early adoption efforts.</li> <li>• One-off investments in social have yielded incremental effects. Layering in social tools to existing rigid processes, or without empowering (and incenting) individuals to take on more responsibility, only adds new tools to conduct yesterday's business. Gains can be seen by using social merely as a new channel for communication, knowledge, and content management – but its full potential is not realized.</li> </ul>	<ul style="list-style-type: none"> <li>• There is growing consensus over these terms, allowing the focus to shift from debate to putting the concepts to work.</li> <li>• <b>Social technologies</b> are the tools that connect people, information, and assets across time and place. Not just about content, but more about context and community.</li> <li>• <b>Social media</b> are the places where people assemble to do work. In this context, the primary implication is assembling and working electronically.</li> <li>• <b>Social network</b> is the actual embodiment of who knows what and who knows whom – the collection of connections and interests expressed in a connected social graph.</li> <li>• <b>Social business</b> is the concept of activating social networks using social technology and media to create business value, across any number of functional or business processes.</li> </ul>
<b>Business Process Reengineering (BPR)</b>	<ul style="list-style-type: none"> <li>• BPR and the ensuing ERP wave were about efficiencies and scale – standardizing and automating business processes, weaponizing the industrial hierarchy. This remains valuable for parts of the organization, especially finance and manufacturing. It had little concern for the individual employees, and even less for the customer.</li> <li>• Rigid processes and standardized roles and job functions made it hard to respond to changes – or to respond to individual customer requests. What your employees – and, in some respect, your business – can do had been pre-determined.</li> <li>• Assumptions embedded in business cultures and limitations of previous technology approaches required command and control designed into systems and platforms.</li> </ul>	<ul style="list-style-type: none"> <li>• Organizational complexities have grown, customers and employees are more empowered, and market conditions are more dynamic than the post-industrial BPR age. Profitability is no longer only a function of scale, but of motivation and sentiment.</li> <li>• Much of business continues to occur outside of the boundaries of traditional tools and standard operating procedures, relying on human engineering (e.g., personal relationships, live conversations) to answer questions, share new ideas, and do their jobs. Social reengineering looks to provide platforms that support the behavior of the leading employees, while also removing unnatural constraints of existing standards and processes.</li> </ul>

## Technology implications

The underlying technology may be the beginning of the social reengineering journey. But providing platforms for sharing, discovering, connecting, and cultivating individual ideas and knowledge for the communal good is not a trivial endeavor. Open communities that span organizational boundaries should solve for legal, compliance, and intellectual property concerns, without extinguishing the enthusiasm of their participants. Specific technology implications include:

Topic	Description
<p><b>Social computing</b></p>	<p>Social tools to improve how employees codify their knowledge, share their deliverables, work jointly on shared tasks, and communicate – including wikis, enterprise social media platforms, idea markets, specialist finders, and digital asset/content management solutions. The technical implications remain very real: entitlement and privacy rights, archiving strategies, discoverability, version control, and more. But social versions of these tools de-emphasize artifacts themselves (tagged documents, explicit listing of skills, tight hierarchies of repositories) in favor of the power of the network to provide context and community – using ratings or “likes” to communicate the quality of assets, allowing interactions to be shared and discovered so that others can benefit from a question that was answered, and creating digital exhaust of who knows what, who knows whom, and how works gets done in the organization.</p>
<p><b>Social monitoring</b></p>	<p>A common part of many social reengineering efforts is building the capability to listen, track, and analyze brand, product, and individual customer sentiment. Tools such as Collective Intellect, Netbase, and others have relatively low technical complexity for initial configuration. However, greater skill and experience is required in tuning the models, thresholds, and analysis to yield more insightful, actionable results. The products are progressing in interpreting nuanced emotion and subtle, sarcastic, or idiomatic expressions, but there is still no substitute for experienced human interpretation to calibrate results and adjust models.</p>
<p><b>Digital content management / digital rights management</b></p>	<p>Community and context are critical, but content also plays a significant role. Digital management of access, entitlements, and rights requires digital asset management, content governance, and stewardship, and tools to enable sharing, distribution, and discoverability of content. Regional and industry laws and regulations should be considered – affecting where content can be created, stored, and accessed.</p>
<p><b>Social platforms and gamification<sup>2</sup></b></p>	<p>Social business platforms require integration of the five postdigital forces – analytics, mobile, social, cloud, and cyber. Each individual force can be challenging. Therefore, a roadmap of incremental advances may be the right approach. The need for authenticating individual personae, enforcing their personalized security and privacy profiles, and allowing traversal and transaction across their collection of interests and connections is a foundational need for many social businesses. If the vast majority of activities are internally-focused, traditional directory services such as Active Directory, Open Directory or OpenLDAP can provide authentication and entitlement services, and social collaboration tools can help manage relationships and sharing preferences. Social businesses extended beyond enterprise boundaries pose a bigger challenge. Several vendors have created open APIs to help – but many assume adoption of their own proprietary identity mechanisms. That is exacerbated with integration to mobile application tools and platforms.</p> <p>Finally, while gamification is a powerful approach to both enabling and transformative social business platforms, the gamification solutions are immature and evolving. In addition, they introduce their own patterns and approaches to mobile and cyber. Adoption, integration, and orchestration will likely be a multi-year journey.</p>

### Lessons from the frontlines

#### Behind the (reengineered) curtain

The mechanics behind how credit cards work are a mystery to many consumers, who rarely know how much it costs them or the financial institution that issued it. Based on this alone, Barclaycard U.S. is breaking from tradition by offering transparency for their new Ring card. But they're not just allowing consumers to look under the hood; they are crowdsourcing what features to include, allowing consumers to create their own credit card experience.

The Ring is a simplified credit card with few fees or rewards. Instead, it allows the customer community to decide how the card is managed. Through an internal social platform designed for the Ring community, customers interact directly with the company. They can vote on changes to the card – everything from increasing fees to editing terms and conditions. Barclaycard releases the Ring's financial performance so customers can offer further suggestions or raise questions. Customers can also interact with each other using topical forums. Gamification principles reinforce specific behaviors, such as in the Giveback program, which distributes some of the Ring's profits to users in proportion to their participation in the forums. Badges can be earned for using paperless statements and other actions<sup>3</sup>.

By listening to customer ideas, Barclaycard has been able to refine their product in a timelier manner than they could with traditional product development cycles. In the first six months of operations, Barclaycard used more than 50 crowd-sourced ideas to improve the Ring and, combined with other customer initiatives, has seen complaints decrease by half. Barclaycard's understanding of customer needs gleaned from community discussion and feedback has allowed them to deploy changes in a timely manner, increasing customer retention by 25%<sup>4</sup>. In short, Barclaycard's Ring Card is helping to redesign credit cards into a community-driven social experience.

#### Global collaboration at the speed of social

General Electric's Colab platform wants to be the virtual water cooler at the office – and more. Ron Utterbeck, CIO for General Electric Corporate and Director of the Advanced Manufacturing Software Technology Center, created the new Colab social platform which has grown from zero users to 124,000 strong in less than a year<sup>5</sup>. Attracting roughly 1,000 new users every few days, Colab has begun to dismantle functional, geographic, and generational silos that large-scale corporations are all too familiar with<sup>6</sup>. The company is an early adopter in this arena, and the chairman and CEO Jeff Immelt is an early and strong supporter. Beyond simply file-sharing in the cloud, the platform allows others to recall the context in which the files were used through its recorded conversations, attached meeting notes, and collaboration history. With a strong base product, the company plans to extend functionality for specific business applications through real-time feedback and iterative release planning. One future plan is to surface small windows to drive relevant decision points – allowing tasks to be completed without logging into entirely different systems.

Timely innovation requires an easy way for users to provide feedback, as well as delivery processes that enable speed and experimentation – even if it means releasing features that are not in their fully functional form. For GE's more than 300,000 employees around the world, the workplace has suddenly has gotten smaller – and a lot more agile.



### Community problem solving

What do chess rankings, grocery shopping, pharmaceutical development, and space travel have in common? These represent some of the topics for predictive modeling competitions hosted on Kaggle, a two-year-old platform for big data analytics. Organizations pose issues such as “when will shoppers go grocery shopping next?” or “how do we predict the likelihood of side effects during the drug development phase?” and provide a dataset for analysis. Kaggle then converts the issue and dataset into a contest, and the research community competes for a prize paid by the sponsoring organization.

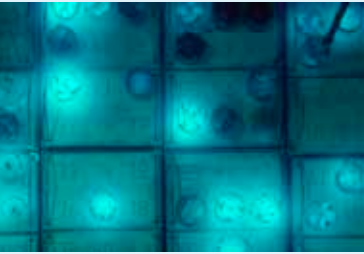
Kaggle provides a social platform for entrants to test and demonstrate their skills, as well as open up opportunities for collaboration. Entrants into Kaggle competitions come from more than 100 countries and vary in disciplines from computer scientists and statisticians to students in glaciology and signature verification<sup>7</sup>. Cross-disciplinary teams naturally form as competitors reach out to each other to collaborate in contests.

In its two years of operations, Kaggle’s community members have contributed nearly 180,000 entries and participated in 67 competitions. By having multiple participants testing different techniques in a competitive atmosphere, promising solutions bubble to the top in a more timely manner than in a typical problem-solving process. For example, in one competition, the Kaggle Community was able to improve Allstate Insurance’s claim prediction ability by 271% in three months<sup>8</sup>.

Kaggle has also recently collaborated with Greenplum to allow companies interested in contracting big data jobs to reach out to Kaggle community members<sup>9</sup>. By identifying leading minds in data analytics, organizations that want to improve their predictive capabilities can mine for talent across the globe.







# My take

**John Hagel**

Co-Chairman

Deloitte LLP Center for the Edge

*Social Reengineering by Design* involves using technology in a more thoughtful and broad-based way to meet business needs in a social context. It is front and center to the question of *How can and should people connect to advance business objectives?*

The traditional 20th century corporation was often about efficient scale through tightly specified and highly integrated activities. There was a predictable performance curve, but at times it turned out to have diminishing returns. It seemed the more experience you had in an industry, the harder it was to get to the next level of performance. This pattern made it difficult to tolerate – much less encourage – innovation, experimentation, and learning. Today, change is occurring at an accelerated pace, as past practices and approaches become less suited to new market and industry needs. What was once efficient isn't always efficient anymore; there are often people in the wrong place, at the wrong time, scrambling to reorganize to meet the needs of the marketplace. The opportunity exists to create a new set of platforms – social platforms – to scale learning and effective innovation, while still supporting efficiency. It's not "either/or," it's "both/and."

Social platforms can be applied to achieve both broad and narrow business goals. For example, social reengineering can be used for exception handling – managing the things that get thrown out of automated processes that individuals need to resolve. Social technologies can allow people to handle exceptions in a more efficient way, perform pattern recognition, and see what exceptions may be indicative of changing needs in the marketplace.

Another application for social reengineering involves learning and talent development to support building skills *wherever, whenever, and for whomever*. If you're serious about learning, driving performance, and developing talent, look both inside and outside the four walls of your organization. Bill Joy famously said, "No matter who you are, most of the smartest people work for someone else."<sup>10</sup> Connecting inside with outside can change your frame of reference. Often, the more people you draw into your network, the faster the entire network learns.

How can we articulate not just the opportunity but the imperative to move toward scalable learning? How can we go in – in a very surgical way, with modest resources – and demonstrate the impact of this shift? Begin by systematically identifying the metrics that matter. Senior executives are typically focused on financial performance. Middle managers are usually more concerned with operating metrics. Frontline managers often address the activities and behaviors affecting those operating metrics.

First identify specific opportunities in the financial metrics, drill down to the important operating metrics that impact those financial metrics, and then look for the frontline metrics that can impact the operating metrics that matter. By taking this approach, you can target the deployment of social technology in ways that get the attention across levels of management and move the needle for the entire organization. Second, resist the temptation to get a gold-plated solution. Use an adequate product for social-enabling the target area of the organization. Actively monitor the impact on the relevant metrics, perform timely iterations to strengthen impact on these metrics, and engage broader support and sponsorship. And third, keep an eye on the bigger picture. The absolute level of performance is often less relevant than the pace of progress; the snapshot of year-over-year performance is often less telling than examining the trajectory over time. In a rapidly moving business environment, even strong performance can be overtaken – winners can accelerate performance improvement over time.

Social platforms help address the important element of tacit knowledge – experience that's hard to express, and gained in time. Scalable learning is often less about codified knowledge and more about connecting, building relationships, and developing trust that prompts people to share what they know. Connecting to knowledge is often less important than connecting with one another. That's the design of social reengineering.



### Flying car future

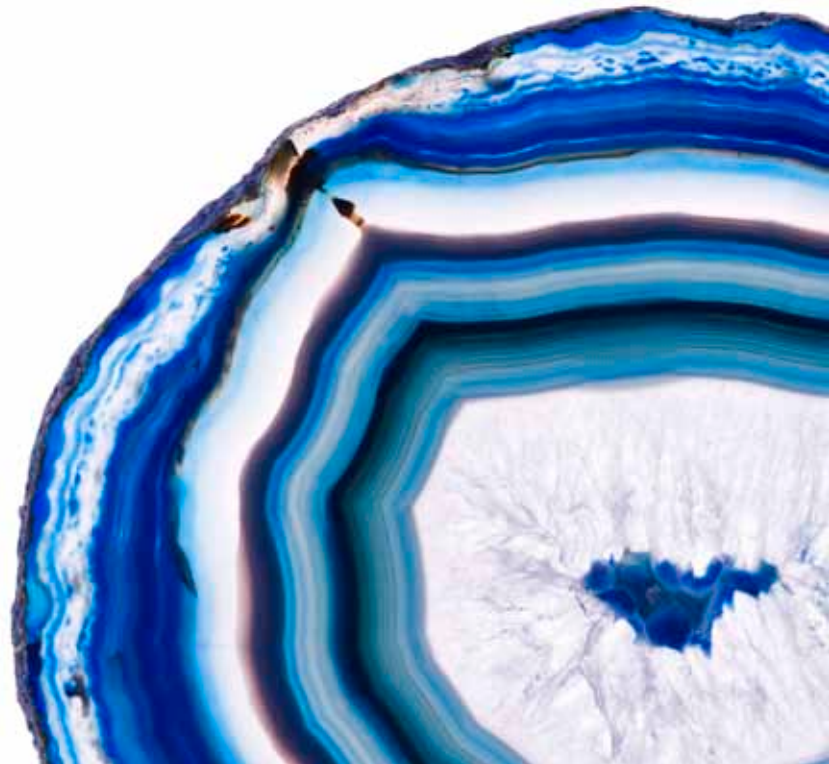
In business today, content is king – the things I know, the things I do, the things I produce. This applies both to “I” at the corporate level and at the individual contributor level. Looking five or ten years down the line, there may be a fundamental shift – where context and community become at least equal (if not more important) players than content. A more fully socially reengineered world of business platforms. What does such a future look like?

Context in its simplest form is the interrelated conditions in which something exists or occurs. For example, an order is the content – the where, when, and by whom an order was transacted is the context. What happened before the order? Was the order in line with a customer’s historical tendencies? Is it something the sales associate typically sells? What can be learned about the weather, local events, or social sentiment surrounding the product? The explosion of geo-location data; big data tracking digital exhaust across social, web, and inside-the-enterprise sources; and mobile devices capturing video, temperature, location, bio-metrics, and other data are providing a treasure trove of context. The inevitable convergence of personal and professional digital identities is an important factor – promoting correlation across an individual’s multiple personas – to unlock the power of context.

Communities will likely continue to evolve the meaning and utility of relationships. As highly specialized social platforms emerge, lexicons will likely form to guide how a given topic is discussed. Social currencies will likely form around levels of knowledge, engagement, and cooperation. The organizations of tomorrow may see a shift in employment models – instead of having the majority of work conducted by full-time employees, dynamic workforces may be tapped based on well-described areas of need. This already exists for low-level, low-skill tasks. But it could easily expand to more strategic functions. The tendency to stockpile knowledge and protect with a “need to know” mentality would shift to value knowledge flows, with “need to share” ruling sensibilities<sup>11</sup>.

If context and community become the basis for flying car competition, then the ability to dissolve and reconnect business processes and their underlying systems becomes critical – responding to the community’s needs based on the context of the market and operation conditions of the company. Outside-in architecture<sup>12</sup> moves from a thought experiment to a mandate. Information and attention become the scarce resources, and the new economy is dominated by those organizations that can identify, share, and amplify experience – across geography, language, and domain constraints.

Very real constraints are in play today that can curb this vision – HR policies, regulatory, labor agreements, tax, and international trade, to name a few. There will likely be a chance to influence some changes based on the realities of the new market – and to push broader reform in light of demonstrated business innovation.



### Where do you start?

Social reengineering by design is about a deliberate approach to recognizing legacy assumptions that may be constraining your business performance, and making your business social. It can require applying the social mantras of transparency and trust, creating new ways to motivate your employees and customers, and reshaping the content and context of work. While this is about technology-enabled transformation of business, the correct order of operations is still often strategy, then people, then process, then technology.

- **Choose your target.** To start, select a business objective in an area which could potentially be positively disrupted if viewed as a social platform. Find areas where there is a natural community of stakeholders that could be tapped, but are currently poorly activated. Places where people, information, and potentially operational assets could be brought together in a social network for a business purpose. Don't let today's behaviors limit exploration. One example might be R&D – linking your marketers, product engineers, and sales team with service technicians and end-users, as well as your upstream manufacturing partners. Another may be demand planning, focused on suppliers, manufacturing, sales, and marketing. Think through business objectives for the area, and what outcomes could be influenced if reengineered using a social mindset.
- **Social discovery.** Identify the social network(s) relevant to accomplishing the selected business objective. This may cross your organization, customers, and business partners – but also external third parties (other vendors, academics, luminaries). Social reengineering is about community, context, and content – in that order. For likely candidates, do some digging. Who are the players that form the community – across internal hierarchies, within customer organizations, at business partners, or external parties? What are their relationships to the target objective? What content and context could empower the community?
- **Carrots and sticks.** Articulate meaningful incentives for the identified social network to engage in the selected business goal. Participation is personal, so this is likely to be customized to the various personas being engaged. How do their interests align, and what are the kinds of personalized incentives that could be laid out to encourage participation in the social platform?
- **Think from scratch.** What constraints are holding back the target area –operationally, organizationally, or technologically? They could be functions of the corporate structure, communication gaps, unwillingness or inability to collaborate, geographical concerns, perceived inequalities based on career levels, “not invented here” biases against external parties participating, or general political distractions. Or they could be well-defined restrictions based on regulatory or legal issues. Reengineering will likely require some drastic changes. From the constraints identified, which ones are within your company's control? Will leadership help break through conventions and support the team through what may be an uncomfortable transition? Resist the instinct to standardize the new process up-front. Set boundary markers to guide behavior in the reengineered world, but leave freedom for experimentation and observe how work is getting done, and how the community is engaging. Let people stroll in the proverbial grass – and wait to pour concrete sidewalks until you understand where they are actually walking.
- **Final stop – the tools.** Now is the time to look at tools and technology solutions – after clarity around business objectives, social platforms, communities, incentives, and reengineering ambitions. By now there's likely a handful of solutions deployed across the various lines of business. These opportunistic social efforts don't necessarily need to be shut down, especially as they're likely aligned to “no regret” pieces of the social value prop – listening, analytics, and customer outreach. See what investments have been made and what can be reused, but don't give undue preference to a stack just because a pocket of the business has already procured it. Make a strategic platform decision based on the broader transformational nature of the reengineered vision. Of course, looking at the tools may generate new ideas about constraints, incentives, or span of the social network, so don't be afraid to iterate.

## Bottom line

The postdigital forces, led by social, can be used to shape business and the way people naturally interact. As time, attention, and engagement of your employees and customers becomes a more precious resource than compute power or standardized efficient processes, social platforms can relieve rather than serve traditional organizational constraints.

We're no longer building technologies to enable just interaction – social platforms can be built for specific business purposes: specialized content, enhanced with context, enriched by the power of communities. This calls for a deliberate, intentional course to rethink how business gets done, using social to reengineer processes, systems, and organization for the new economy. It is a course driven not by efficiencies and scale, but by mindshare and engagement.

## Authors



### Stephen Redwood

Principal, Deloitte Consulting LLP  
sredwood@deloitte.com

Stephen Redwood specializes in helping organizations transform through culture change, leadership development, behavioral change, and organization redesign. He supports clients in their efforts to address the human capital and organizational implications of emerging technologies.



### Chris Heuer

Specialist Leader, Deloitte Consulting LLP  
cheuer@deloitte.com

Chris Heuer is a leading social media and collaboration strategist, focused on Social Business strategy, design, and adoption. Chris helps organizations apply design thinking to cross-boundary collaboration between employees, partners, and customers to save time and improve performance.

## Endnotes

- <sup>1</sup> Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 1.
- <sup>2</sup> Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 2; and in Deloitte Consulting LLP (2013), "Tech Trends 2013: Elements of postdigital", [www.deloitte.com/us/techtrends2013](http://www.deloitte.com/us/techtrends2013), Chapter 6.
- <sup>3</sup> Kit Eaton, *Barclaycard's Ring Calls On Crowd To Build A Better Credit Card*, <http://www.fastcompany.com/1822714/barclaycards-ring-calls-crowd-build-better-credit-card> (March 2012).
- <sup>4</sup> See: <http://groundswelldiscussion.com/groundswell/awards2012/detail.php?id=815>
- <sup>5</sup> King, R, *GE Colab Tool Brings Good 'Peeps' to Life*, <http://blogs.wsj.com/cio/2012/12/03/ge-colab-tool-brings-good-peeps-to-life/> (December 2012).
- <sup>6</sup> Robert Berkman, *GE's Colab Brings Good Things to the Company*, <http://sloanreview.mit.edu/feature/ges-colab-brings-good-things-to-the-company/> (November 2012).
- <sup>7</sup> See: <http://www.kaggle.com/About>
- <sup>8</sup> Case study: "Allstate: Predicting liability for injury from car accidents", <http://www.kaggle.com/host/casestudies/allstate>
- <sup>9</sup> "EMC and Kaggle Partner to Enable On-Demand Data Scientist Workforce," EMC Corporation press release, October 23, 2012, on the Greenplum web site, <http://www.greenplum.com/news/press-release/emc-and-kaggle-partner-to-deliver-on-demand-data-scientist-workforce>, accessed January 2, 2013.
- <sup>10</sup> Bornstein, D. *Social Change's Age of Enlightenment*. Retrieved January 10, 2013, from <http://opinionator.blogs.nytimes.com/2012/10/17/social-changes-age-of-enlightenment/>
- <sup>11</sup> John Hagel III, John Seely Brown, and Lang Davison, *The Power of Pull: How Small Moves, Smartly Made, Can Set Big Things in Motion* (United States: Basic Books, 2012).
- <sup>12</sup> Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 10.



# 4 Design as a Discipline

## Design should be much more than a project phase

Design is already part of the IT vocabulary. Functional design. Technical design. Detail design. Testing design. User interface (UI) design. Technical architecture design. And, more recently, user experience (UX) design – a hot area of focus as consumer technology experiences are resetting expectations for corporate IT. Throughout its history, however, design has generally remained a discrete set of deliverables or project phases, completed by specialized teams at distinct points during a project’s lifecycle. Individual facets of design have reflected little understanding of other related project activities, much less the broader context of the business vision and expected outcomes.

Meanwhile, usability, intuitiveness, and simplicity have moved from aspiration to mandate, with the business having access to new ways to get what it wants: directly procuring cloud services, digital solutions, and mobile apps that are “good enough” to meet their needs. In this open marketplace for IT, business relevance and user engagement are competitive currency. Many CIOs find their organizations lack the skills and craft to mint the new coin.

What’s missing may be a commitment to design as a business discipline, a commitment that takes shape by asking: *What benefits would we gain if design were a pervasive and persistent aspect of each part of the enterprise?* This kind of thinking moves design from just another software development lifecycle (SDLC) phase to an integral part of the IT environment. It shifts the focus from “How do I meet the requirements?” to “Why is this important in the first place?” and “How could we innovate to improve it?” Enterprises can reach this vision, but it often takes a deliberate approach, intentionally applied, by a new mix of talent. The CIO is positioned to make it happen.

Pockets of disciplined design are emerging, but rarely go beyond the front-end interface. UI is important, to be sure, but design shouldn’t stop there. Front-end design is only as good as its foundational architecture – and only as valuable as the resulting user engagement. Poorly designed transactional services, data feeds, social platforms, and

underlying infrastructure can derail even an elegant user interface. Utility and ergonomics are important, but not in the absence of reliability, security, scalability, and maintainability, particularly in a hyper-hybrid cloud environment<sup>1</sup>. Jack Dorsey reflected on the artistry and imagination behind the Golden Gate Bridge, but one of its most important features is rarely mentioned: resiliency. Seventy-five years later, the Golden Gate Bridge is still standing<sup>2</sup>.

A mind shift is likely required to start the process. Think “system” as in *systemic*, not as in *software*. Focus on designing experiences, not just user interfaces. Zoom above the development lifecycle and look at design as a cross-cutting discipline. It’s not an “IT thing” or a “marketing thing” or a “product engineering thing.” It’s an “enterprise thing.” New skills, capabilities, tools, and methods are often required to sustain the journey. Taking ideas from the fields of architecture and industrial design, or from the application of anthropology and behavioral psychology, into each stage of solution definition, ideation, and realization. Multi-disciplinary teams should practice concurrent design in a highly collaborative model, blending creative, UX, engineering, and functional knowledge to encourage the cross-breeding of ideas. Transparency is the ultimate design objective – where the UI is invisible and things just work.

Consider the banana – a nearly perfect design. It fits perfectly in the user’s hand. No manuals are required to understand or use it. The packaging is non-slip, easy-to-open, and bio-degradable. And it dynamically communicates status information. The skin color broadcasts its readiness for consumption – green is too early, brown too late, yellow just right. An unconventional example? Perhaps, but it illustrates the point. And you can expect that it will likely be both challenging and humbling for technology designers.

IT can create a new niche for itself by cornering the market on design. On the front-end, on the back-end, creative, user experience, applications, services, data, and infrastructure. Design weaponized as a repeatable, deliberate approach. *Design as a Discipline*.

## History repeating itself?

Design has spurred research and debate throughout the modern industrial age – historically by visionaries such as Horst Rittel, Bryan Lawson, and Nigel Cross, and today by the likes of Dieter Rams, Philippe Starck, and Frank Gehry. Design also has a presence in many top companies, though often as something that lives between sales and marketing, and less so as a set of skills or underlying core competency across a business’ functions. Too often design has been relegated to a phase of a project, or a silo of activity, with fixed inputs and outputs to the rest of the organization.

	What were the challenges?	What’s different in 2013?
<b>Design thinking</b>	<ul style="list-style-type: none"> <li>• <i>Design thinking</i> is an old term that has seen a resurgence of interest. Coined by Herbert A. Simon in 1969<sup>3</sup>, it has gained recognition in recent years through the work of the design firm IDEO<sup>4</sup>, as well as programs such as the Hasso Plattner Institute of Design at Stanford<sup>5</sup>. Agencies and product vendors are trying to capitalize on the new-found popularity – crowding the market with different messages on the what, why, and how of design thinking.</li> <li>• Design thinking is often interpreted as a distinct process, prescriptively combining divergent and convergent ideation, anchored in achieving a well-defined goal. In this model, design thinking can become compartmentalized, as opposed to a new, holistic, disciplined approach.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Design as a Discipline</i> represents a systemic expansion of <i>design thinking</i>. It looks at the important intersection between creative, business experience, domain knowledge, and technical engineering – creating shared language, shared approaches, and shared goals toward problem solving across the enterprise.</li> <li>• Design as a Discipline can knock down the compartmentalized boundaries of design thinking, moving beyond product marketing and R&amp;D to various parts of the organization. Shifting to an enterprise-wide conversation – where each project strives to include creative, business, and engineering talent. It can take an iterative, experimental, and experiential approach across the technology lifecycle – from portfolio planning and requirements gathering to new capabilities around monitoring, improvement, and release planning.</li> </ul>
<b>User engagement<sup>6</sup> / User empowerment<sup>7</sup></b>	<ul style="list-style-type: none"> <li>• User engagement emphasizes working backward from an end-user persona to guide experiences that get automated. The mantra of designing from the user-down – not system-up – continues to hold true. The danger lies in stopping at the front-end or focusing on creative and user-interface components without understanding downstream, back-end implications.</li> <li>• User empowerment adds to user engagement the forces of consumerization and democratization of IT. Users and customers expect to get technology from the enterprise that is at least as good as the technology they have at home. And they expect to get it when they need it, without undue time, cost, or bureaucracy. The challenge has become how to be responsive to these demands yet remain true to the disciplines of risk management and quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Design as a Discipline builds on the user engagement and user empowerment mantras – extending the persona-based approach to the underlying data, application, and infrastructure services.</li> <li>• Design as a Discipline shifts from separate, adjunct processes to being embedded in overall solution delivery. Instead of having a separate team working to enable ERP through mobile, usability and user experience design skills are embedded across the entire ERP project, informing not only mobile use cases, but also more conventional threads like business process templates, business intelligence visualization, and interface specifications.</li> </ul>

## Technology implications

Art meets science at the heart of design as a discipline, but there is still plenty of science involved – in the underlying technology layer assisting solution development, and in the deliberate approach that infuses creativity into the system.

Topic	Description
<b>Digital backbone</b>	The need for a reusable set of services and solutions across an organization’s digital domains is becoming critical. These solutions are important building blocks for design as a discipline. Potential areas include content, rights management, mobile, social, web, eCommerce, customer analytics, identity, credential, and access management – as well as heavy sales and marketing capabilities, including customer relationship management, sales force automation, campaign management, and search management. An enterprise-wide digital backbone can accelerate design as a discipline adoption and create clarity about the integrated nature of foundational technologies.
<b>Integration / orchestration</b>	Being able to bring together data and transactional services for end users is a universal need. A detailed integration layer is important to allow tiered quality of service for orchestrating between data and systems and for managing trade-offs between reliability, speed, and performance.
<b>User experience (UX)</b>	UX is an indispensable ingredient in design as a discipline – and it involves much more than abstract aesthetics or screen layout. It involves a mix of field research, the creation of detailed user personas and stories, build-out of service diagrams, information architecture of the actor, tasks, and broader context, and conceptual design of the end-user experience. The desired skill set requires a mix of creative designer and anthropologist, ideally with a layer of specialization based on solution channel (e.g., mobile, web, social, digital ERP).
<b>Agile development</b>	Long ago, industrial design leading practices standardized on close collaboration across multi-disciplinary teams. IT departments spearheading design as a discipline should follow suit. That requires business and domain specialists, creative, UX, engineers, and QA to work together through each phase of the project. A focus on timely development can force the breakdown of project goals into discrete digestible components, with each iteration resulting in a potentially releasable end product. Design will likely evolve as incremental features are built, responding not just to technical specifications, but also to the actual usability, utility, and experience of the end product. Many organizations claim to have dabbled with Agile in the past, but few ever moved beyond an iterative waterfall approach (affectionately known as “wagile” or “agerfall”). Part of the challenge in adoption is likely to include shedding biases, rewiring delivery models, and mechanically building out the tools for new ways of handling requirements, release and configuration management, and testing.
<b>Prototyping</b>	Moving quickly from concept to prototype is a core tenet of design as a discipline. Just as industrial designers use three-dimensional printers to vet potential product concepts, IT departments need the ability to realize working interactive models of potential solutions. HTML5-based frameworks, native mobile development tools (such as Apple’s Interface Builder, Eclipse’s Graphical Layout Editor for Android, and Microsoft’s Visual Studio 11), and third-party tools (e.g., FluidUI, OmniGraffle, and Wireframe Sketcher) are viable approaches. Choose platforms aligned with your overarching digital strategy.



## Lessons from the frontlines

### Ready for takeoff

The airline industry is a tough nut to crack, with high fuel and equipment costs, shifting demand, and route and airport capacity limiting market growth. In the face of these challenges, Virgin Atlantic Airways has taken a different path to distinguish itself – banking on a strategy of making travel an enjoyable and fun experience.

Virgin's emphasis on design and style permeates the user experience from the moment they book a flight and experience the easy Web interface. The gate terminals offer relaxing lounges which include elevated laptop tables and dining areas featuring local food. On board the aircraft, customers encounter the signature purple mood lighting, custom cabins with chairs that can be converted to beds, an onboard bar, and an interactive entertainment system<sup>8</sup> – all of which are meant to give the feeling of a five-star hotel. These features are the product of concerted efforts to build relationships with other parts of the company and communicate the importance of thinking about design at different steps. The result is intended to be a flight that people look forward to.

Design elements are also included in intangible aspects of customer experience. The company's service design team looks to improve the whole customer service experience by imagining what the entire experience of traveling for customers could be – and then planning service guidelines around that vision. One of Virgin's innovations is the Upper Class Wing, which aims to get customers from limo to lounge in ten minutes. Passengers are picked up by chauffeured car service, checked in using a drive-through process, and then directed through a private security passage to the Virgin Clubhouse lounge area<sup>9</sup>.

Virgin Atlantic has worked hard to infuse design principles across the company and deliver a reputation built on customer experience, and the payoff has been dramatic. When the new cabin configuration was rolled out, Virgin Atlantic's market share increased by 2% – or approximately £50 million<sup>10</sup> and customer satisfaction was over 90%<sup>11</sup>. The company has also been recognized with numerous industry awards for excellent customer experience and service awards. Virgin Atlantic Airways continues to take-off through innovation and design.

### One more thing

From white ear buds to the rounded rectangular shape, Apple has helped to define technology product innovation for the Internet age. Its minimalistic style can be identified easily – the look of their website, the style of their stores, the layout of their products, and more. Although Apple's design ethic is often discussed in reference to the look and feel of products, almost every aspect of the customer experience is carefully designed to work together.

From the outset, Apple flipped the idea of how to do design on its head. Instead of having engineers telling industrial designers to make components and batteries look nice, Apple first decides how a product will look on the outside, and engineering makes the technology fit the vision. Apple's design process also merges the talent of many different disciplines – from product design to mechanical engineering. The company works closely with manufacturers to select materials, and stretches their capabilities by challenging them to develop new methods<sup>12</sup>. The result is a series of products designed to be easy to use and intuitive, even to users who are unfamiliar with technology.

As consumers demand that technology do more and more, it can be difficult to control technological complexity. Apple products have strictly adhered to a policy of simplicity, and their devotion to design has produced an identifiable brand which has attracted outsized media attention and a loyal customer base. On the first day of the recent iPhone 5 launch, Apple sold two million units and was back-ordered for at least three weeks<sup>13</sup>. In the smart phone industry, Apple earns as much as 70% of the profits in the market. For tablets, the number is 85%.<sup>14</sup> Apple has become one of the most profitable companies in the world, at least in part by making technology accessible and stylish.

### Design everywhere (even on your wall)

When looking at Nest, the modernistic consumer thermostat designed by Tony Fadell (the father of the iPod), it would be easy to get caught up in the product's aesthetics. The minimalistic LED display. The ease of use by rotating the entire device as a control knob. The simplicity of menus for set-up and programming. But it's clear that design discipline extends throughout the company. Pre-sales are centered on a simple interactive Web app to help determine compatibility with existing furnaces and thermostat configurations. Installation involves two screws and snap connectors for wiring. A multi-head screwdriver is included in the packaging – with options covering not only Nest's needs, but those you'll likely encounter when removing your old thermostat. A carpenter's level is even built into the mounting hardware.

Control – using the device itself, a cross-platform mobile app, or the Web – is intuitive and consistent. A platform-based operating system allows A/B testing of system menus, letting the company capture user feedback and fine-tune its overall UX. Self-updates and patching are handled via embedded Internet connectivity. And a self-learning function aims for a hands-off approach to energy efficiency – combining analytics of past behavior and sensors to track whether you are home or not – to self-regulate temperatures. The result? Glowing reviews and growing market share<sup>15</sup>, in an unlikely product category.





# My take

**Emily Pilloton**

Founder and Executive Director

Project H Design

I live and breathe and bleed design – but I’m also extremely critical of the formal discipline and programs commonly taught today. I grew up making things, and got into design because I thought it was about creative problem solving. In school I became disenchanted with how architecture and product design felt disconnected from real world challenges. That’s why I started my own nonprofit to practice the kind of design I believe in: the nitty-gritty, rigorous problem solving, physical, making kind of design.

I teach design and construction skills at REALM Charter School in Berkeley, California. Dubbed “Studio H,” it’s an engaging program that develops very marketable people, but it’s not about resume building or vocation. It’s about enabling the 4 Cs of design – critical, creative, complex, and communicative skills.

Previously, I taught the same Studio H program in rural North Carolina with students who had never taken an art class and could not even read a ruler. After 12 months in our program including one summer with us, they had designed and constructed an award-winning building – a community farmers’ market for their hometown that created a dozen new jobs and two new businesses. Many of our students walked away feeling like everything is possible, and that they had the tools to make things happen. They learned that you don’t need to settle. The designer’s “yes, and…” mentality taught them to keep pushing the constraints of the situation and the quality of their own work to create something both functional and beautiful.

While it takes specific training, skills, and experience to be a strong designer, I argue that almost anyone can – and should – use design-thinking principles. I equate it to being able to pull the scientific method out of a scientist’s process and apply it generally at work. Some people mistake design as solely about the creative process. It is, but it’s also very rigorous. You might have to start your thinking over many times during the design journey, because you don’t initially know where you’ll end up or which path or paths you should take. You should be comfortable with that. You should be brave, vulnerable, and raw enough to

allow change to really happen. You can’t be all about control. In many ways, design thinking is antithetical to the modes of operation business leaders have been socialized to use – where things are linear, step-by-step, replicable, and homogenous.

The good news? You don’t have to throw schedule and budget out the window. Some of the best designs typically happen within really tight constraints, so use them in a positive way rather than as a shackle. The project in North Carolina had a \$70,000 budget for everything – student stipends, permits, contractors, nuts, and bolts – and the students had only 90 days to complete the building. Those constraints pushed the students to make really creative decisions.

I believe you can’t design a good product unless you talk to people. We can each be a specialist in our own area and have our own awesome thing. It’s more about openness and collaboration and a healthy codependence. A developer isn’t taking away from his abilities by talking to a marketer; he’s enhancing his ability to do his job. You can’t do your own awesome thing well unless you open your arms to others.

Incorporating design as an enterprise discipline requires strong leadership: you need a champion who can help others see the value. Sometimes, those who do embrace design do it with about 10% of the intensity they should. Many people hear “design thinking” and say “I want that in my team.” But it tends to become just another meeting people have to go to, and it doesn’t permeate the culture.

Design as a discipline is not for every business or organization. It can require being comfortable with being uncomfortable, and innovating at the core instead of around the edges. If you’re going to attempt it, then I say “go big or go home.” Not everyone needs to get on the design bandwagon, but if you do, get on and stay on.

## Flying car future

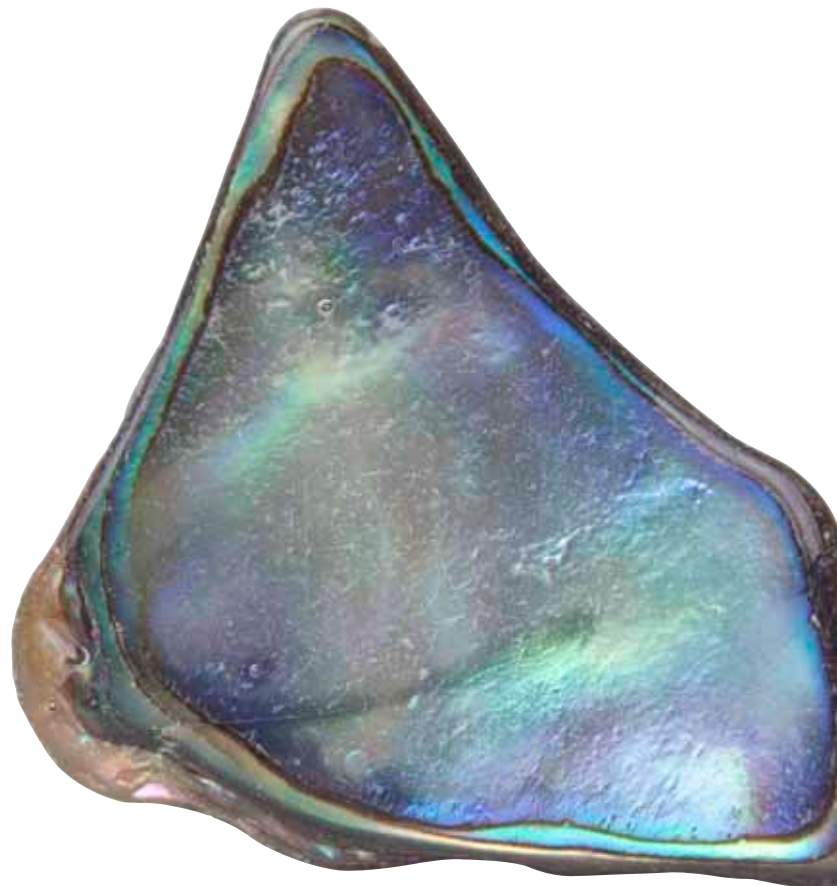
Leonardo Da Vinci established the credo that “simplicity is the ultimate form of sophistication”<sup>16</sup>. Design as a discipline is following this cue – moving towards transparency and smooth integration across computing devices, applications, and increasingly connected physical devices.

Transparency is the evolutionary path of the user interface. We’ve moved from character-based interaction with main-frame and DOS programs, to mouse-based interaction with client/server and Web-based solutions, to touch-based interaction with today’s mobile devices. All require an explicit step of tactile manipulation of a computing node. The future will likely continue the journey, relying on voice controls, gestures, and context – knowing who you are, where you are, and what you’re likely trying to do – to trigger ambient functionality. For example, walking through the check-out with your cart full of goods could trigger: facial recognition to confirm identity, calculation of the amount due, searching through social profiles to determine coupons or other promotions, and processing payment from a mobile wallet – all without requiring you to directly interact with any explicit piece of technology.

Behind the scenes, this scenario requires a staggering level of integration – in both the design of solutions to pair user experience with the underlying technical demands, and also across the various components allowing for the end-to-end experience. In the example above, identity and entitlement management services are performing the user authentication, point-of-sale scanners are working with pricing engines to determine amount due for the specific cart of goods, sales and marketing engines are interacting with public social profiles and loyalty services to determine potential savings, and mobile wallet services are interacting with checkout scanners and back-end payment processors to settle the transaction.

Many of these services will likely be designed without knowing exactly how they will be used, or with what systems they’ll be interfacing. The back-end aspects of design as a discipline require a services-based approach – at the business level (what problems they’re trying to solve) and at the technical level (having a well-defined, contract-based interface compatible with Web services standards). Solution components need to represent equal parts Lego and Play-Doh – well-defined standardized building blocks, complemented by solutions that can adapt to less-prescribed needs.

Industry standards will likely evolve to help unify data models (similar to what FIX and SWIFT did for electronic exchange of financial information in the early 1990s), and technical components will likely continue to support open, standards-based protocols for session management and information exchange. But another turning point will likely be when policies are encapsulated and externalized – the business rules and analytical models that drive the behavior of companies’ underlying systems. The “plug and play” nirvana of our flying car design as a discipline can likely be realized only if semantic meanings of data and underlying business logic can be shared and more universally understood – within and across organizational boundaries.



### Where do you start?

Design as a discipline efforts often encounter two broad objections. They are seen as either too daunting given existing talent pools, or too nebulous and fluffy. Modest beginnings can lead to profound changes.

- **User first.** Begin by taking a persona-based, user-focused approach – understanding who the stakeholders are, how they live and work, and the context of the problem you’re trying to solve. Empathy is critical – from field research on how users are behaving today, to divergent thinking to capture “out there” ideas about how they might behave tomorrow. Design as a discipline prioritizes user stories, conceptual designs, and prototypes to solicit feedback on potential design options using “show,” not “tell,” techniques – often discovering features and capabilities that would be missed in conventional requirements JAD sessions.
- **Solution design.** It’s not enough to focus on gorgeous visuals and intuitive front-ends. Solution engineers should participate in each phase of the project – from up-front visioning to solution ideation to finalizing conceptual design. This helps keep the “art of the feasible” present as concepts are being explored. Technical complexity might be required because of truly differentiated features or complex end-user needs, but it should be a conscious choice. Don’t get caught in a situation where technical lightweights drive scoping and front-end design without understanding how to make concepts real.
- **Product mindset.** Similar to their industrial design brethren, IT shops should adopt product marketing and engineering mentalities – committed to frequent incremental releases, with freedom to react in a timely manner to opportunities. Product owners from the business become critical members of the extended IT community – owning the product vision and roadmap. Goodbye bloated once-a-year budgeting and static portfolio prioritization exercises. “Just good enough” releases may become standard, releasing partially complete solutions to garner real-world usage feedback and drive the next iteration of features and fixes.
- **Avoid tissue rejection.** Choose an early business sponsor with simpatico sensitivities. The big picture goal of design as a discipline involves extending across the enterprise at large. But manufacturing or finance might not be the right places to start. Some CIOs have initially focused on marketing departments – groups who appreciate design and UX skill-sets, have grown wary of traditional IT approaches and solutions, but are charged with making massive IT investments as digital changes their worlds. Sales is another good place to start, where you’ll likely find vocal user advocates working in well-defined processes with potential improvement from a user-based, design-oriented approach.



## Bottom line

Having in-house design knowledge is a strategy to stay relevant to business executives who are enticed by new ways of procuring technologies outside of the CIO's purview – from one-off cloud purchases to departmental and line-of-business technology initiatives. Consumerization and democratization can be threats to the IT department, or they can be the impetus for design as a discipline – moving information technology from its existing cross-roads forward, with intent, to a preferred state.

For corporate IT, design as a discipline is the “so what” and the “or else” of today's consumerization wave. It is a chance to change how solutions are delivered – borrowing from industrial designers and architects – by combining highly complementary skill sets to foster divergent ideation, innovation, and streamlined product build-out. It is also a chance to change perceptions of what to expect from IT, setting a baseline of engaging, elegant solutions that combine intuitive interfaces with reliable, secure, scalable, performing technology stacks. And as importantly, it is a way to bring new approaches to the realization of business needs – showing responsiveness to the new normal of usability in consumer technologies.

## Authors

### JR Reagan

Principal, Deloitte & Touche LLP  
jreagan@deloitte.com

JR Reagan, CISSP, CISM, CRISC, is the U.S. Federal Chief Innovation Officer and also leads the HIVE (Highly Immersive Visual Environment), a state-of-the-art demonstration and development center located with the Center for Federal Innovation in Arlington, Virginia.



### Nelson Kunkel

Director, Deloitte Consulting LLP  
nkunkel@deloitte.com

Nelson is the National Creative Director at Deloitte Digital, leading a group of experienced creative and design thinkers to transform the postdigital landscape. His primary focus is to evangelize the role of design in technology, and the ways in which we can affect the lives of others through our client's work.



## Endnotes

- <sup>1</sup> Additional information is available in Deloitte Consulting LLP (2012), “Tech Trends 2012: Elevate IT for digital business”, [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 5.
- <sup>2</sup> Schonfeld, E. *Jack Dorsey & The Golden Gate Bridge (Exclusive Video)*. Retrieved December 9, 2012, from <http://techcrunch.com/2011/03/24/jack-dorsey-golden-gate-bridge/>
- <sup>3</sup> Herbert A. Simon, *The Sciences of the Artificial (First Edition)*, (Cambridge: MIT Press, 1969).
- <sup>4</sup> See: <http://www.ideo.com/about/>
- <sup>5</sup> Polly LaBarre, *Inside Stanford's creativity factory*, <http://management.fortune.cnn.com/2012/08/17/inside-stanfords-creativity-factory/> (August 17, 2012).
- <sup>6</sup> 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 9, and Deloitte Consulting LLP (2011), “Tech Trends 2011: The natural convergence of business and IT”, <http://www.deloitte.com/us/2011techtrends>, Chapter 8.
- <sup>7</sup> Additional information is available in Deloitte Consulting LLP (2012), “Tech Trends 2012: Elevate IT for digital business”, [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 1.
- <sup>8</sup> Ben Mutzabaugh, *New Virgin Atlantic suites: More 'chic,' less 'bling'*, <http://travel.usatoday.com/flights/post/2012/04/virgin-atlantic-shows-off-its-new-upper-class-suites/678355/1> (April 23, 2012).
- <sup>9</sup> Joe Ferry, *The Big Rethink*, [http://www.designcouncil.org.uk/joeferry?WT.dcsvid=NDA5OTYwMzk2NQs2&WT.mc\\_id=](http://www.designcouncil.org.uk/joeferry?WT.dcsvid=NDA5OTYwMzk2NQs2&WT.mc_id=) (March 2010). Transcript
- <sup>10</sup> *Eleven Lessons: managing design in eleven global brands*, <http://www.designcouncil.org.uk/elevenlessons> (2007).
- <sup>11</sup> *What Virgin Atlantic Did Next*, <http://www.designcouncil.org.uk/publications/Design-Council-Magazine-issue-3/What-Virgin-Atlantic-did-next/> (Design Council Magazine, Issue 3, Winter 2007).
- <sup>12</sup> Daniel Turner, *The Secret of Apple Design*, <http://www.technologyreview.com/featuredstory/407782/the-secret-of-apple-design/> (May 1, 2007).
- <sup>13</sup> Catherine Kaputa, *5 Marketing Tools Apple Exploits To Build The Hype*, <http://www.fastcompany.com/3001650/5-marketing-tools-apple-exploits-build-hype> (September 28, 2012).
- <sup>14</sup> Tim Bajarin, *6 Reasons Apple Is So Successful*, <http://techland.time.com/2012/05/07/six-reasons-why-apple-is-successful/> (May 7, 2012).
- <sup>15</sup> Fehrenbacher, K. “Hundreds of thousands” of Nest learning thermostats sold. Retrieved December 9, 2012, from <http://gigaom.com/cleantech/hundreds-of-thousands-of-nest-learning-thermostats-sold/>
- <sup>16</sup> See: <http://www.leonardodavinci.net/quotes.jsp>



# 5 IPv6 (and this time we mean it)

## The backbone of the Internet is straining. And we're running out of time.

Internet Protocol (IP) is how we connect to anyone and anything on the Internet. Every participating device, application, or service has a distinct address – a way to identify itself and communicate with other devices, applications, and services. Today's IP standard, IPv4, dates back to the 1970s. It allowed for 4.3 billion unique IP addresses, which was more than sufficient to meet the computing demands of the time. Fast forward to 2013, with more than a billion personal computers in use<sup>1</sup>, a billion smartphones<sup>2</sup>, many times as many corporate desktops, laptops, network equipment, and servers, and a growing number of non-traditional sensor and actuator devices, including cars, thermostats, aircraft engines, elevators, and vending machines. IP addresses have become a scarce resource, already exhausted in some regions: Asia Pacific (APNIC) ran out in April 2011; Europe (RIPE) in September 2012; and IPv4 in North America (ARIN) will likely be fully assigned by spring 2014<sup>5</sup>.

The problem has been understood for decades. The next generation Internet Protocol (IPng), widely known as IPv6, was announced by the Internet Engineering Task Force (IETF) in 1995<sup>6</sup>. This new standard allowed for 340 undecillion ( $10^{36}$ ) unique addresses, along with improvements in protocol-level security, routing, and network management.

Unfortunately, there has been little sense of urgency to adopt the new standard, especially for private enterprises and public sector agencies. Workarounds such as network address translation (NAT), dynamic host control protocol (DHCP), and private addressing have eased the burden inside many organizations – allowing each company to operate comfortably with its own set of private addresses within its firewalls. U.S. federal government mandates have set deadlines that have passed<sup>7</sup>, setting the precedent for a “wait and see” mentality.

But we're approaching a breaking point, fueled by growth of mobile adoption, increased pace of public cloud adoption, and the explosion of new end points with Internet connectivity via embedded sensors on physical objects. This will likely force enterprises that work with customers and business partners via the public Internet to move to version 6 as their primary communication method in the next two or three years.

In response to this deadline, you may be saying, “OK, a change is coming, but I still have time.” Not quite. In reality, the migration from IPv4 to IPv6 may take years to complete. The hardware impact is significant, though likely this aspect is the most mature today. Networking routers, switches, and load balancers; servers, desktops, and laptops; smartphone, tablets, and feature phones; printers, web servers, and storage arrays are all affected. And it doesn't stop there. The entire application stack should be assessed – especially with the historical reality of hard-coded network addresses in code, scripts, and configuration files. Like with planning for Y2K, you should examine, remediate, test, and promote assets that may have gone untouched for years. Security solutions need similar handling. Firewalls, intrusion detection appliances, and third party suppliers should be examined. Architecture and engineering policies as well as network operations should be updated to take advantage of IPv6 in the configuration and management of capabilities.

This is a daunting task for which action should not be deferred much longer. IPv4's sunset is no longer a question of if, but of how soon. Telecommunications, hardware and systems software providers, and content providers have been leading the way – ahead of customer and enterprise demand. Organizations should follow suit promptly. This time, we really mean it.



### History repeating itself?

IPv6 is anything but new – a standard that was conceived nearly 20 years ago. Few CIOs are unaware of the issue, but, outside of telcos and high-tech providers, it is rarely high on corporate IT agendas. The barrage of priorities assaulting the CIO is partially to blame. Budget crunches. IT efficiencies. Cost cutting. Pressure from the business to expedite cloud, mobile, and social adoption. Unyielding pressure for an always-on, incident-free technology footprint. And more. But fatigue surrounding the topic is also partly to blame. The Internet Engineering Task Force (IETF) has been pushing for adoption for at least a decade, but the “smoking gun” to change behavior has just now begun to manifest.

	What were the challenges?	What’s different in 2013?
<b>IPv6</b>	<ul style="list-style-type: none"> <li>IETF is somewhat a victim of its own prescriptive vision. Instead of waiting for the issue to mount, the impending-but-distant exhaustion of IPv4 addresses spurred a task force almost 20 years before the issue would reach climax. The real near-term issue has been diluted by years of posturing, vendors attempting to co-opt the topic with solution refreshes, and general confusion on the impact as regional IP authorities saw their stockpiles of addresses exhausted (which happened to APNIC and RIPE), with little evidence of adverse effect.</li> </ul>	<ul style="list-style-type: none"> <li>The premonition that the IP sky is falling is finally coming true – with the combined storm of globalization, cloud/mobile proliferation, and the explosion of embedded sensors and connected objects. Familiar enterprise workarounds such as NAT and DHCP are reaching their limits, and many large organizations are facing years of effort to complete safe IPv6 deployment. CIOs should look beyond historical bias and see what IPv6 means to their business circa 2013, and how to mitigate risk of continued reliance on IPv4.</li> </ul>
<b>Y2K</b>	<ul style="list-style-type: none"> <li>IPv6 is sometimes equated to the fervor around the Year 2000 (Y2K). Part of the rhetoric rings familiar: a potentially catastrophic issue at the core of our computing environments that requires systematic remediation across network, hardware, and software stacks. The non-event at the actual turn of the century is often cited as proof that such prognostications are nothing but hype.</li> </ul>	<ul style="list-style-type: none"> <li>Y2K activities were a hedge against a theoretical issue. IPv6 is a fact-based, cut-and-dried problem. We are running out of unique network addresses, even as the number of objects connected to the Internet is growing exponentially. IPv6-addressed devices are not anticipated to be able to talk freely and effectively to IPv4 infrastructure without continued workarounds. This will likely affect almost every corporation, organization, and governmental agency.</li> </ul>





## Technology implications

Migration to IPv6 has wide-reaching implications – at the network, server, end-point, and application levels. Planning has to cover the potential need for open-heart surgery during the transition, while supporting ongoing compatibility between IPv4 and the new protocol.

Topic	Description
<b>Routing</b>	IPv6 features a fixed-length 40-byte header. Removal of options fields from IPv4 limits router processing. Fragmentation is only allowed by the source and destination nodes. Individual routers do not have to spend time processing checksums or handling extension headers.
<b>Procurement</b>	New hardware and software installations or upgrades should explicitly feature IPv6 and IPv4 compatibility. Operating system, networking hardware, virtualization packages, network and security management solutions, and large commercial applications have featured dual-support for years. Cross-compatibility is not a given for second-tier providers. IPv6 adoption is deemed inevitable. Make sure you're protecting existing assets for eventual migration.
<b>Security</b>	IP Security (IPSec) is a native, mandatory part of the IPv6 protocol – authenticating and encrypting each IP packet of a session. Instead of relying on application-layer adherence to secure sockets layers (SSL) or transport security layer (TSL), security is automatically handled by the protocol itself. IPv4 could accommodate IPSec, but not as a default – requiring updates to the IP implementation of every device along the communication route. This is impractical for internal networks, and likely impossible for traffic covering public networks.
<b>Quality of service</b>	IPv6 includes a "flow label" field in the header to prioritize packets that need to arrive at their destination close together with low latency, such as video streaming and voice over IP.
<b>Deployment options</b>	<p>There are three primary deployment options:</p> <ul style="list-style-type: none"> <li>• <b>Tunneling.</b> IPv6 hosts talk to IPv6 infrastructure via an end-to-end tunnel that traverses IPv4 networks, effectively establishing a tunnel between IPv6 endpoints. The IPv6 traffic flows are encapsulated by a router with an IPv6 interface inside IPv4 packets and routed through IPv4 endpoints to the other endpoint, where an IPv6-enabled router reassembles the IPv6 original packets and send them to the IPv6 target.</li> <li>• <b>Dual-stack.</b> Infrastructure components are upgraded to support both protocols, with dual IPv4 and IPv6 addresses. IPv4 users and clients will see only IPv4-enabled components and vice versa. Beyond hardware and firmware updates, critical applications should be validated to operate in the dual-stack mode.</li> <li>• <b>Network Address Translation 64 (NAT64).</b> Building from today's common practice of mapping one public address to many private addresses, NAT can be used to translate IPv6 traffic to IPv4 – maintaining dependencies on application layer gateways (ALGs) to correctly monitor and route some types of traffic.</li> </ul>

## Lessons from the frontlines

### No more excuses

Before deploying IPv6, we can learn from Google, who began making the transition in 2008. Their initial approach involved a small, core team of engineers who spent an additional 20% over their regular work hours for 18 months to make Google publicly available over IPv6. But it wasn't as easy as it seemed. Lorezno Collitti, a network engineer at Google, said IPv6 needs to be production-quality or it's of no use.<sup>8</sup> IPv6 transition must be done properly.

Transitioning services over to IPv6 involves more than just a software and hardware update. The time required for auditing, upgrading software, reconfiguring, and testing for an IPv6 roll-out can take 12 months, with associated costs likely to far outweigh the costs of any required software or hardware upgrades<sup>9</sup>. An effective transition also requires management buy-in and a clear understanding of its business values. For early adopters like Google, it required considerable support from external vendors who weren't yet faced with surging demand for IPv6 support, further exacerbating IPv6's chicken-and-egg problem. Google's effort to deploy IPv6 in its own enterprise network, which has been underway for four years, was a larger undertaking than the team had anticipated<sup>10</sup>. As of December 2011, the project was only half finished, though 95% of the company's engineers have IPv6 access at their desks<sup>11</sup>.

Vinton Cerf, Chief Internet Evangelist at Google and one of the founding fathers of the Internet, says, "There are no more excuses. You have to be able to run both IPv4 and IPv6 all the time, anytime, because this is not going to be turned off. For any ISP and any edge provider, if you are not capable of running IPv6, you are not being noticed. Get going. Get IPv6 running."<sup>12</sup>

### Brazil's Silver Bullet

Silver Spring's early commitment to an IPv6 standards-based networking platform has changed the utility industry's approach to modernizing the grid. In 2006, Silver Spring introduced the industry's first IPv6-based smart grid networking platform<sup>13</sup>, and has since networked more than 11 million homes and businesses worldwide. Raj Vaswani, Chief Technology Officer at Silver Spring Networks, envisioned a networking platform as the foundation for smarter energy networks of the future. Securing networks and assigning IPv6 addresses to elements in the power grid, such as onsite customer meters, can allow for greater coordination, reliability, and efficiency of electricity delivery and use. According to Vaswani, open communications protocols and standards-based infrastructure are a founding principle at Silver Spring Networks. "Our approach has been to build an open

network optimized for the massive-scale machine-to-machine (M2M) communications across millions of devices that are required for the next generation of smart energy networks," he says.

In October 2012, Silver Spring introduced a new smart grid offering for the Brazilian market. Partnering with Brazil utilities, Silver Spring integrated standards-based communications solutions that were tailored to Brazilian utilities. The upgrade has not only assisted Brazilian utilities to meet the requirements of the recently published Agência Nacional de Energia Elétrica (ANEEL) mandate, but also established a networking foundation for future grid-modernization investments.

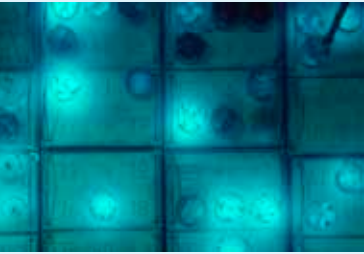
Eric Dresselhuys, Executive Vice President of Global Development of Silver Spring Networks, says, "Leveraging these great products on a highly reliable, IPv6 networking platform will empower our clients to meet the ANEEL mandates while improving operational efficiency and revenue realization, while also delivering ever greater value to all of their customers."<sup>14</sup> With the accelerating pace of devices being connected online, Silver Spring is helping to lay the foundation for a massive-scale global machine-to-machine network – starting with the smart grid.

### Not as easy as it looks

Two years ago, U.S. Federal CIO Vivek Kundra released a directive requiring all federal agencies to transition their public-facing Web sites to IPv6 by September 30, 2012<sup>15</sup>. But by November 2012, a snapshot from NIST revealed that less than half of U.S. government domains were on IPv6<sup>16</sup>. Among the early leaders was the Defense Research and Engineering Network (DREN). DREN's chief engineer, Ron Broersma, says that getting an early start was critical to keeping transition costs low. Its transition in 2010 was done over a five-year period with no additional staff.

Speaking at the 2012 North American IPv6 Summit in Denver, Broersma explained that agencies should gain some IPv6 operational experience to prevent mistakes in implementation. He focused particularly on the operational complexity of a native dual-stack implementation and the lack of IPv6/IPv4 parity as areas where important lessons must be learned. "The business case for DREN's IPv6 deployment is business survival," said Broesma, but the 'killer app' for IPv6 is the Internet itself.<sup>17</sup>

Kundra's memo also established a second deadline of September 30, 2014, for federal agencies to upgrade internal client applications that communicate with public Internet servers to use native IPv6.



## My take

**John Curran**

President and CEO

American Registry for Internet Numbers (ARIN)

When I talk about IPv6 (Internet Protocol version 6), people often think “technology niche.” But what I’m really talking about is *Internet connectivity*. A company can choose whether or not to use wireless personal devices or move to virtual machines, but with IPv6, the question comes down to this: “Are you trying to reach everyone on the Internet, or aren’t you?”

Companies spend significantly to reach target audiences on the Internet. Imagine making that type of investment and finding out you missed the target. When someone lays out a proposal for a new system or application, keep in mind that the Internet itself is changing. If you don’t include IPv6 in your planning, your investments may not achieve your desired ROI.

Work on IPv6 has been ongoing for 20 years, and the technology has been stable and standardized for the last 15 of those years. But now we’re actually running out of IPv4 addresses globally, which makes it time for IPv6 to come into the spotlight. In practical terms, that means service providers likely have two choices: stop adding new customers, or invest in IPv6. For example, one U.S. telecommunications carrier recently announced the roll out of IPv6 over their entire mobile network. This was not for the love of new technology, but to keep business growing. When you build applications – web, mobile, or traditional – you may not know in advance if your customers will connect with IPv4 or IPv6, so it’s important to support both IPv4 and IPv6 for your public-facing systems. Make sure that IPv6 is part of your systems development lifecycle, so that you’re connecting to the whole Internet, not just the “old” Internet.

The timeframe for investing in IPv6 has already begun. If you generally upgrade your systems every few years, then including IPv6 in your efforts will mean that your regular systems development cycle will make your systems both IPv4 and IPv6 reachable. Consider the incremental expense of upgrading now. If your competition is enabling IPv6 and you’re not, it may well

get to a point where they will be better able to reach your target customer base with greater performance than customers connecting to your antiquated IPv4-only systems. In the next two or three years, there will likely be customers that connect using IPv6 only. There are already cases where networks are predominantly IPv6-connected. Some networks in France, Korea, and Japan use IPv4 primarily for backwards compatibility. As this trend continues, the companies that have planned ahead should progress smoothly, while the ones that haven’t may be left scrambling to catch up via last minute efforts.

Y2K and IPv6 are similar in many ways. But with Y2K, it was happening all at once, and there was only one thing to test: what happened when the date rolled over. IPv6 is being incrementally deployed by service providers globally, and requires that companies plan compatibility with the rest of the world by deploying IPv6 connectivity for their systems today.

A big challenge for companies is that IPv6 is a parallel world to IPv4. IPv6 works the same way and runs on the same equipment as your current network, but your systems have to be specifically configured to speak it in addition to IPv4.

I offer three pieces of advice. First, if you receive a proposal from a team for a system that involves Internet connectivity but doesn’t specify both IPv4 and IPv6, you haven’t been given a recipe for success. Second, don’t be afraid to experiment and get some hands-on experience. Turn on IPv6 for some of your smaller applications, and be prepared to learn. Third, find experts and training. There are professional courses, consultants and advisors, and great online resources available. Make it a priority for your network, application, and security staff to pay attention to IPv6 – both for your company and for their own careers. IPv6 knowledge has become highly sought after, and the time to start is already passing.

### Flying car future

We are 20 years into the legacy of IPv6 – with enterprises just starting to pay attention. And yet, a burning question looms. What comes next? Should CIOs expect an IPv8 or beyond?

Not likely for the foreseeable future. Addressable space will almost certainly not be the driver for the next iteration. With IPv6, we now have 670 quadrillion addresses available per square millimeter of the Earth's surface<sup>18</sup>.

Content, access, and rights management are more likely factors – especially if the vision of mass digitization of content and the evolution of a persistent, transferable, non-reputable digital identity takes shape<sup>19</sup>. With cloud-based storage and services, expanding digital content, and expectations for smooth portability of consumption across a growing expanse of devices, protocol-level handling of identity, access, and entitlements could become a necessity.

One reason is performance – allowing advanced compression and routing algorithms to logically improve throughput across the existing physical network and fixed spectrum. A boon for efficiency in today's world may become a necessity for next generation media, as high-definition video gives way to personalized, interactive content and science fiction standards like immersive three-dimensional environments or holographs. Another important reason may be that as personas are digitized, protection of identity and content rights will likely become as important as today's protection of information assets. What IPsec standardization is to IPv6, content and identity management may be to future incarnations – creating mandatory, low-level handling of a critical building block for tomorrow's digital age.



### Where do you start?

With business strategies inseparable from technology, it's hard to find a company that is not highly dependent on its network. This makes IPv6 a broad issue. Each company and agency will likely have its own timeline and path forward, but general leading practices have evolved: a discovery effort of enterprise assets; planning and executing remediation; testing; research into regional, national, and industry constraints and compliance concerns; assessment of deployment options against business strategy; planning and road-mapping; and executing an iterative risk-managed roll-out. And there's more.

- **Timing.** A first question is "when do you start?" While many CIOs understand the looming reality of IPv6, there has not been a burning platform or hard deadline to drive action, especially as the need has lingered for decades and workarounds have been effective. Here are some of the common reasons that may spark action: expansion into geographies with depleted public address registries. Uptick in enterprise assets relying on 4G connectivity (which is based on IPv6). Growth in sensor and embedded connectivity initiatives across manufacturing and the extended supply chain. Tight interactions with governmental bodies, many of which are being mandated to adopt.

Even without a clear forcing function, Gartner estimates that by 2015, 17% of global Internet users will use IPv6, with 28% of new Internet connections running the protocol<sup>20</sup>. Eventually you'll likely be forced to migrate if you want to maintain communication with your customers and business partners.

As mentioned above, many of your IT assets will in some way be affected – making the move a potentially high risk to core business operations. By starting now, you should have enough lead-time for the deliberate, phased roll-out described above. Waiting could lead to a costly, risky fire drill.

- **Front door.** Regardless of overall timing, the first step should be to establish an IPv6 Internet presence for public-facing marketing, sales, and support utilities. The DMZ is a good place to start and firewalls, intrusion protection devices, load balancing devices, and management tools should be addressed. Gartner identifies three choices that enterprises have to implement IPv6 support in their public Internet services: (1) upgrade all Internet-facing systems to support IPv6; (2) upgrade only front-end devices and deploy IPv6-to-IPv4 protocol gateways; or (3) build a separate, IPv6-only, Internet presence<sup>21</sup>. Evaluate this targeted adoption to gauge readiness of your network operations, application operations, and security teams to handle a broader migration.
- **Business case.** It may be tempting to relegate IPv6 to a plumbing play. To be fair, users won't likely see an immediate and tangible difference in their lives. Unlike mobile, social, or analytics adoption, much of the impact is behind the scenes. Yet, effective migration can help protect critical infrastructure on which the business is dependent. Network management and routing efficiencies can also be expected. In addition, the protocol can natively handle certain security procedures, allowing individual security services such as IPsec to be phased out – though only when IPv4 has been completely retired. Explore these cost and management efficiencies to create a business case that is more compelling than fear, uncertainty, and doubt. Or bundle the infrastructure readiness with a broader mobile enablement or digital backbone effort – balancing the allure of new business capabilities and technology-based innovation with the critical (but perhaps uninspiring) infrastructure retooling.

## Bottom line

As connected computing has become a ubiquitous part of business and leisure, part of the Internet foundation is faltering. Internet Protocol has become a universal address scheme for networking, but we've run out of new addressable space. With the explosion of mobile devices – especially with asset intelligence and machine-to-machine embedded connectivity in literally everything – unique IP addresses are becoming a scarce resource. The implications are many. Constraints on innovation, unwieldy network management, and security concerns, such as the deployment of v6/v4 bridges in Asia that strip identity and allow for true anonymity. The IPv6 standard has existed for decades, but we're at a point of finally having to take the issue seriously.

IPv6 is a bit like Y2K – with an ironic twist. A looming-but-unknown deadline, but where the repercussions of no action are precise and potentially catastrophic. Each piece of the migration is manageable. It's the scope that is complex, as every piece of your IT footprint is potentially affected. Organizations that start now will likely have time to take a measured approach, limiting risk without dominating the entire IT agenda. Those that wait may be forced to scramble – or get left unconnected.

## Authors

### Edward Reddick

Director, Deloitte Consulting LLP  
ereddick@deloitte.com

Eddie Reddick is a Director in Deloitte Consulting LLP's Public Sector practice with over 20 years of experience as a manager and leader. He has led and contributed to consulting assignments covering business and IT strategy, portfolio management, network engineering, cloud strategy, and migration.



### Bruce Short

Director, Deloitte Consulting LLP  
bshort@deloitte.com

Bruce Short is a Director in Deloitte Consulting LLP's Technology, Strategy & Architecture practice. His areas of specialization include enterprise data center and networking design, operations, and strategy, with supporting capabilities in IT asset management, IT security, disaster recovery, and IT operations.



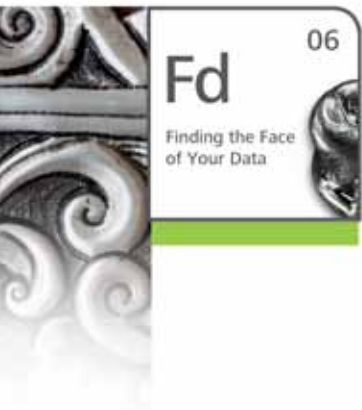
## Endnotes

- <sup>1</sup> Tarmo Virki, *Computers in use pass 1 billion mark: Gartner*, <http://www.reuters.com/article/2008/06/23/us-computers-statistics-idUSL2324525420080623> (June 23, 2008).
- <sup>2</sup> Lunden, I. *Mobile Milestone: The Number Of Smartphones In Use Passed 1 Billion In Q3, Says Strategy Analytics*. Retrieved December 7, 2012, from <http://techcrunch.com/2012/10/16/mobile-milestone-the-number-of-smartphones-in-use-passed-1-billion-in-q3-says-strategy-analytics/>
- <sup>3</sup> See: <http://www.apnic.net/community/ipv4-exhaustion/ipv4-exhaustion-details>
- <sup>4</sup> See: <http://www.ripe.net/internet-coordination/ipv4-exhaustion>
- <sup>5</sup> IPv4 Address Report available at <http://www.potaroo.net/tools/ipv4/index.html>, accessed December 9, 2012.
- <sup>6</sup> See: <http://tools.ietf.org/html/rfc1752>
- <sup>7</sup> Steven J. Vaughan-Nichols, *US government gets an "F" for IPv6 Internet make-over*, <http://www.zdnet.com/us-government-gets-an-f-for-ipv6-internet-make-over-7000005055/> (October 1, 2012).
- <sup>8</sup> Carolyn Duffy Marsan, Google: IPv6 is easy, not expensive, <http://www.networkworld.com/news/2009/032509-google-ipv6-easy.html> (March 2009).
- <sup>9</sup> Gartner, Inc., "How to Upgrade Internet Connectivity With IPv6, While Keeping IPv4," Bjarne Munch and Neil Rickard, June 27, 2012.
- <sup>10</sup> Haythum Babiker, Irena Nikolova, and Kiran Kumar Chittimaneni, *Deploying IPv6 in the Google Enterprise Network: Lessons Learned (Practice & Experience Report)*, [http://static.usenix.org/events/lisa11/tech/full\\_papers/Babiker.pdf](http://static.usenix.org/events/lisa11/tech/full_papers/Babiker.pdf) (December 2011).
- <sup>11</sup> Joab Jackson, *Usenix: Google Deploys IPv6 for Internal Network*, [http://www.cio.com/article/696247/Usenix\\_Google\\_Deploys\\_IPv6\\_for\\_Internal\\_Network](http://www.cio.com/article/696247/Usenix_Google_Deploys_IPv6_for_Internal_Network) (December 2011).
- <sup>12</sup> Huque, S. *Are You Part Of The 1%?* Retrieved December 9, 2012, from <http://www.informationweek.com/infrastructure/ipv6/are-you-part-of-the-1/240005029>
- <sup>13</sup> "Silver Spring Networks Successfully Completes IEEE 802.15.4g Interoperability Testing," Silver Spring Networks press release, September 5, 2012, on the Silver Spring Networks web site, <http://www.silverspringnet.com/newsevents/pr-090512.html>, accessed December 28, 2012.
- <sup>14</sup> "Silver Spring Networks Extends Global Smart Grid Leadership With New Offerings for Brazilian Utilities," Silver Spring Networks press release, October 23, 2012, on the Silver Spring Networks web site, <http://www.silverspringnet.com/newsevents/pr-102312.html>, accessed December 9, 2012.
- <sup>15</sup> See: <https://cio.gov/wp-content/uploads/downloads/2012/09/Transition-to-IPv6.pdf>
- <sup>16</sup> See: <http://usgv6-deployment.antd.nist.gov/cgi-bin/generate-gov>, accessed November 30, 2012.
- <sup>17</sup> Ron Broersma, *Enterprise IPv6 Deployment - Lessons, Observations*, <http://www.v6.dren.net/RMv6TF-DREN-2012.pdf> (April 2012).
- <sup>18</sup> Gartner, Inc., "Internet Protocol Version 6: It's Time for (Limited) Action," Neil Rickard, originally published December 8, 2010; updated May 24, 2012.
- <sup>19</sup> Gartner, Inc., "How to Upgrade Internet Connectivity With IPv6, While Keeping IPv4," Bjarne Munch and Neil Rickard, June 27, 2012.
- <sup>20</sup> The Federal CIO Council Strategy and Planning Committee Technology Infrastructure Subcommittee Federal IPv6 Working Group, *Planning Guide/Roadmap Toward IPv6 Adoption within the U.S. Government*, <http://www.ipv6forum.com/dl/presentations/USGv6Roadmap.pdf> (May 2012).
- <sup>21</sup> Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", [www.deloitte.com/us/techtrends2012](http://www.deloitte.com/us/techtrends2012), Chapter 8.



En

Enablers



# 6 Finding the Face of Your Data

## Hidden patterns in big data can trigger breakthrough insights – if you have the data scientists to guide discovery

In December 2012, an Internet search for “big data” returned more than 100 million results. A 2012 report from the Wikibon community pegged the big-data marketplace at \$10 billion in 2012, growing to \$48 billion in 2015<sup>1</sup>. In the past year, over \$1 billion has been invested into private companies that focus on big data solutions<sup>2</sup>. The majority of big-data market growth can be attributed to business’s increasing interest in related analytics capabilities to drive improved decisions through improved insight. Not surprisingly, some business executives feel big data is over-hyped. Others claim its value is under-realized.

As early as 2001, Gartner’s Doug Laney coined three Vs that make data “big” – volume, velocity, and variety<sup>3</sup>. Now other Vs are being put forward. *Validity* addresses reliability and lack of ACID<sup>4</sup> transactional characteristics. *Venue* speaks to complexity from a high diversity of data sources. *Visualization* is an effective tool for putting big, complex data sets and analyses into actionable forms. Possibly the most important V, though, is *value*. How do organizations extract real business value on a repeatable basis?

Your data should have a face – to be made personal, to foster a more meaningful relationship, and to be expressive. That first requires knowing your data – understanding what exists inside and outside of your walls, with some sense of accessibility, quantity, quality, and context. It also requires interpreting your data for big (and little) insights. Many leading organizations recognize that harnessing data requires a special blend of talent and technology – man and machine – to create the magic of breakthrough insights.

Humans can do many things really well, things that machines have yet to master: visual feature detectors for analyzing adjacency and symmetry; and contextual,

symbolic, and idiomatic semantic analysis for sentiment and meaning. Empowered by visualization tools, the human mind can also carry out initial pattern discovery and supervise cleansing, correlation, refinement, and anomaly identification. Machines are suited for pattern mining, running complex analytical models, and exposing possible insight areas in a feedback loop with their human counterparts. The cycle of consistent refinement is important – supplementing sophisticated programmatic learning with human experience to discover the potential of your data assets.

The importance of human thinking to combine data and technology is significant – as many organizations have learned – and the talent is in short supply. Finding data scientists and data professionals with both IT and line-of-business knowledge (e.g., supply chain, claims, customer) can be frustratingly difficult. In fact, Harvard Business Review recently called the data scientist the “Sexiest Job of the 21<sup>st</sup> Century.”<sup>5</sup> Experienced professionals in the new information landscape are similarly scarce across various disciplines: storage, transmittal, mining, visualization, automated heuristics, and predictive modeling. Publicity around analytics in the 2012 U.S. presidential election has further raised the profile of – and demand for – advanced pattern discovery<sup>6</sup>.

Big data alone, however, creates no new value if it doesn’t lead to insights – about questions you haven’t answered before, or perhaps more importantly, about questions you didn’t know you could ask. For that, you’ll need new ways to capture and explore data, to enrich data and to interact with data. You should also identify new patterns in areas you’ve never explored, anticipate potential value and insights, and zero in on specific crunchy questions whose answers can lift performance and competitiveness. Man and machine, working together, to find the face of your data.

### History repeating itself?

*Finding the Face of Your Data* is an evolution of long-standing research practices – including sense-making, artificial intelligence, ontology, machine learning, pattern matching, and visualization<sup>7</sup>. It also represents the culmination of enterprise data disciplines – from data management to information automation to business intelligence. Beyond core technical advances, a difference in 2013 is the readiness of the business to explore advanced information techniques – and combine these foundational elements into a deliberate, multi-tiered approach.

	What were the challenges?	What's different in 2013?
<b>Data mining</b>	<ul style="list-style-type: none"> <li>Was focused primarily on internal structured data with early exploration of external unstructured data.</li> <li>Outcomes were focused on inventorying and cataloging; build-out of metadata, tagging, and taxonomy is important, but only valuable if the ground-work is harnessed for business insights.</li> </ul>	<ul style="list-style-type: none"> <li>Recognition that four dimensions of data – internal, external, structured, and unstructured – are valid asset categories; mining efforts expanding across all data universes.</li> <li>Tagging evolves into taxonomy discovery and opens new insights to both structured and unstructured data.</li> <li>Emergence of pattern discovery techniques goes deep in structured, unstructured and the seam in between – semi-structured. Discovering new answers, and even new questions.</li> <li>Domain experience has been recognized as indispensable in guiding discovery – with requisite skills added to efforts for context and guidance.</li> </ul>
<b>Big data</b>	<ul style="list-style-type: none"> <li>Hundreds of terabytes of information are produced each day across internal and external data sources. Organizations are struggling to decide what data to enter, and how to determine data quality, persistence, and archiving strategies.</li> <li>Ethical and legal repercussions are often not well understood. Is there assumed liability if insight was available in data that was analyzed? Does it matter if the insight was discovered or not? Are you obligated to report information that was discovered, even if it was not related to the original query?</li> <li>Hundreds of vendors – both new and old guard – are aggressively investing around big data. Beyond market confusion, the lack of reference architectures and leading practices has helped curb adoption.</li> <li>A talent shortage has limited the benefits organizations are seeing from early investments. Because organizations don't have history with big data, it is challenging to know if an identified pattern is an anomaly or truly a trend.</li> </ul>	<ul style="list-style-type: none"> <li>Sector-specific leading practices are emerging, lowering complexity and the subsequent talent learning curve – while providing precedents for legal liability and compliance implications.</li> <li>Universities have new certification and degree programs for big data disciplines.</li> <li>The mixed approach of human governance and automated pattern mining can provide an effective balance, allowing controlled tactical responses to be autonomously triggered, while allowing human counterparts to combine pattern discovery with traditional analytics and business intelligence to inform more strategic decision making.</li> </ul>
<b>Analytics</b>	<ul style="list-style-type: none"> <li>Analytics remains a huge opportunity area, but many companies are still struggling with foundational data management layers – and find themselves struggling to generate operational reporting, much less predictive and prescriptive analytics.</li> <li>Confusion around the relationship between traditional data techniques such as data warehouses, business intelligence, and operational data stores versus emerging topics such as big data, visualization, and machine learning has contributed to stalled investment momentum.</li> </ul>	<ul style="list-style-type: none"> <li>Core data management disciplines lie at the heart of <i>Finding the Face of Your Data</i>. They can also accelerate analytics adoption.</li> <li>Growing understanding about the complementary nature of traditional data disciplines, big data, visualization, and analytics. With adoption will likely come industry standards, leading practices, and reference architectures to further clarify relationships and inter-dependencies.</li> </ul>

### Technology implications

Discovering useful patterns in big data – and knowing how to exploit them – often requires a baseline of data quality, governance, and stewardship of the raw information assets – as well as the ability to understand and correlate relationships between data sources. “Garbage in, garbage out” remains a truism – and can undermine efforts to empower discovery, automate decision-making, and take advantage of human intuition and insight.

Topic	Description
<b>Data governance</b>	Taxonomies and relationships are critical for understanding data sources. Crawlers and knowledge discovery tools can help categorize data sources both within and outside of organizational boundaries. Hadoop, HPCC, Disco, and other distributed systems allow for data capture at speeds appropriate for the data source – batch or real-time, asynchronous or streaming. Detailed data processing is possible to change, refine, aggregate, analyze, and report during transmission – allowing relevant signals to be persisted and acted upon, bypassing torrents of extraneous data. In addition to tools for discovering and sharing core data attributes, cleansing and stewardship should be enacted for data quality and integrity. Solutions vary from highly automated to predominantly manual scrubbing and upkeep.
<b>Methods, modeling, and statistical data professionals</b>	Many organizations will likely need to source data science talent from outside the business – especially in early stages of adoption. While business domain experience is equally important and may be found within the company or industry, advanced mathematical, statistical, and computing skill is also often required, including in natural language processing, information retrieval, knowledge representation and reasoning, machine-learning technologies, and cognitive computing.
<b>Master data management</b>	Understanding relationships between master data entities across and beyond the organization is critical to identifying advanced patterns. Techniques can be as simple as managing look-up tables or as sophisticated as probabilistic matching algorithms and bidirectional automated maintenance of updates across systems of record. But without correlation of master data, associations could be missed – leading to incomplete or incorrect conclusions. Availability of shared digital identities can help simplify master data disconnect – either internally, or using common social platform identifiers such as LinkedIn profiles or Facebook Connect authentication.
<b>Data architecture</b>	This involves the physical manifestation of data governance and master data relationships. New capabilities in big data and analytics introduce new tools and techniques – including in-memory computing, appliance-based hardware/software composite solutions, distributed computing, and non-relational and column-based databases. Compression, archiving strategies, and sourcing options (including vendors and cloud versus on-premise solutions) can further complicate the picture.
<b>Visualization</b>	Visualization tools allow the analysis of unstructured data, with interactivity to explore high volumes of multi-dimensional data. Approaches vary – from custom frameworks to allow custom build-out of HTML5 or native mobile renderings, to prepackaged tools such as Clickview, Microstrategy, Spotfire, and Tableau.
<b>Flows versus stocks</b>	The velocity characteristic for big data – sometimes called “fast” data – has implications for the network as well as for raw processing speed. The emerging need is to process flows versus stocks. That is, extracting insights and signals from data streams in near real-time instead of storing “everything” for later consideration. Combined with the basic transmittal challenges of unstructured data types, such as video and raster image, there are still fundamental technology challenges in the data center, the core network, edge and content delivery networks (CDNs), and last-mile and high-bandwidth interconnects.

## Lessons from the frontlines

### Winds of change

From tracking crime statistics and reports of graffiti to building permits, the city of Chicago has collected enough data to fill more than 400 servers in its multiple data centers scattered through the city<sup>8</sup>. And now the city is pulling together their data sets into one public platform to find new ways of making the city a better place to live.

The city began building a massive data portal, using primarily open-source software, pulling in unstructured data such as real-time transcript excerpts from 911 and 311 calls, as well as structured data from disparate systems across 30 agencies and departments. The goal of the portal is to give city officials a way to combine data from different agencies to reach new conclusions. For example, if crime is trending up in one area, analysts can look for causal factors, such as the density of liquor licenses or changing patterns of police protection. City officials can then use the data to predict and prevent new problems. For example, one investigation revealed that garbage cans in a particular zip code often disappeared when the alley lights went out. If the city could replace alley lights more quickly, they could avoid having to replace garbage cans as often<sup>9</sup>.

The data portal has the added benefits of increasing governmental transparency and enhancing its ability to deliver services in a timely manner. For example, the city analyzed what information is most often requested using the Freedom of Information Act (FOIA), and published those data sets first. To increase accountability, the city built the Public Performance Management Dashboard to evaluate how well each department delivers services. Built using feeds from the portal, the dashboard is already helping some departments make improvements in operations<sup>10</sup>.

The city is continuing to develop the platform over the next couple of years and has already seen progress in soft metrics, such as increased public trust and collaboration with the developer community.

### A prescription for insight

Recombinant<sup>11</sup> began as a company focused on cohort identification for health care systems – identifying patients with specific characteristics needed for clinical research studies. The Recombinant team built a practice on the implementation and extension of i2b2, an open source software application funded by the National Institute of Health that provides clinical and research analytics.

While working with pharmaceutical companies, Recombinant realized that analytic tools being used by health care systems could also be used to improve clinical trials. Pharmaceutical companies face many of the same problems as health care systems, notably, that work is being completed in silos. For example, a drug may be tested in clinical trials for both rheumatoid arthritis and psoriasis – but the data from the clinical trials for the two diseases aren't analyzed together or with outside data sets to identify deeper insights. Recombinant used i2b2 to create a database that added genomic signals to the clinical information with the goal to identify correlation signals inside large datasets and to create data liquidity across studies and within an organization. Recombinant then extended the platform for use at multiple pharmaceutical companies under a new open source project called tranSMART.

Recombinant is continuing to work with clients to extend the applications of tranSMART. For example, a company may want to conduct new studies for drugs that fail to gain FDA approval. Say a drug gets approved in Phase I and II of clinical trials, but fails Phase III because 5-10% of patients benefitted and many experienced side effects. tranSMART could be extended with relevant data sets to identify predictive biomarkers that would help identify patients to include in the next trial who would likely see desired results with the drug. By discovering hidden patterns in the biological data, the next trial could benefit 90% of patients with adverse side effects for 2%. This could rescue and reposition the previously failed drug and provide patients with a new drug to fight their disease.

Computers are great at detecting patterns, but these studies come with a risk of false discovery. Bioinformaticists and other experienced team members are critical. They can determine what signals are valid and reproducible, and refine the analytics in way in which computers aren't capable. Pharmacogenomic pattern discovery is a new discipline for the pharmaceutical industry and opportunity abounds for those who embrace it.

### Surveying the data landscape

With a commitment to customer service, American Express continuously looks for ways to enhance their customers' experiences with their products. The Global Advertising and Brand Management team at American Express administers a survey to its customers which essentially asks, "How likely are you to recommend our products to others?" The survey contains both structured data and unstructured data in the form of comments about customers' experiences with its products. American Express uses the survey data to drive product changes to continue to meet their customers' needs.

Customer comments range from high-level thoughts to specific, detailed experiences with a product. Until recently, the company that administered the survey on behalf of American Express was manually reviewing hundreds of thousands of survey responses. The process was time-consuming and sometimes specific insights and trends were overlooked due to the variation with which employees at the company interpreted comments from around the world. So American Express' Risk and Information Management team invested in big data infrastructure and innovative text mining techniques to improve the process. They shortened the time required to conduct the analysis of survey data from weeks to hours.

Automating the survey analysis with text mining techniques, American Express was able to more quickly process survey data and identify new patterns in customer experiences such as cardmembers' appreciation of features and services that help them improve the management of their personal finances. A self-service tool developed for the Marketing organization allowed them to see, first-hand, general customer preferences at a specific moment as well as how those preferences changed over time. Adding visualization tools, American Express was able to see trends in the data that are leading them to build products that fit customers' changing needs. And although American Express has only used this technique for customer product survey data, the method is scalable across the company's other services, such as travel, rewards, and corporate cards.







# My take

**Tom Soderstrom**

IT Chief Technology Officer, Office of the CIO  
Jet Propulsion Laboratory (JPL)

At JPL, we have a fundamental philosophy that “IT” should stand for “Innovating Together.” The jobs of the IT leaders are to provide the environment for that to happen – where our employees can work with virtually anyone, from anywhere, with any data, using any device, at any time.

Consumer-driven IT, big data, and mobile are important factors for our increasingly IT-savvy users. By adding pervasive cloud and immersive visualization and interaction, we have a formula for Innovating Together. When talented, curious people interact with high-V data (high volume, velocity, and/or variety) in high-performing collaborative environments, they can discover valuable new things (the fourth V is for value). Assemble a team of scientists from different disciplines such as oceanographers, climate change specialists, statisticians, aerospace engineers, and economists – either in person or virtually – and they will likely uncover insights that wouldn’t otherwise be found. Human behavior is what really drives analytics – the computers bring the data to the people who can sense the results.

The challenge is that these multi-disciplinary teams should include data scientists – individuals who can teach the data to tell an interesting story we didn’t already know. These are individuals who can look at data – both structured and unstructured – manipulate it, use data mining and machine learning capabilities, determine statistical relevance, and then model and communicate the results so that others care. That’s a tall order for one person – and so the data scientist may actually be a group of people.

We used this multi-disciplinary approach at JPL and created collaboration centers, which are essentially “Conference Rooms ++.” For example, we thought it was about giving visualization tools to our mechanical engineers, but they were already accustomed to translating blueprints into three-dimensional images in their minds. Those who really benefitted from the visualization tools were the electrical and propulsion systems folks. With the visualization tools, the team was able to see the same thing together, enabling breakthrough insights. The true *Big Value* from *Big Data* can

come when we provide real-time visual analytics to co-located specialists from different disciplines and let them innovate together.

For outreach, we put information in public clouds in order to share interesting information about NASA and science. We’ve also done mission-critical work this way, putting Mars Exploration Rover data in the cloud to assist scientists all over the world to collaborate more effectively. It was secure, and saved us an order of magnitude on cost and two orders of magnitude on response time – which is critical when you can only communicate with spacecraft once a day.

If I were to give advice on this trend to other technology executives, I would focus on four things:

1. Redefine “IT” as Innovating Together. We have unexpectedly IT-savvy people within our organizations. For example, we had a librarian who turned out to be a closet developer and made publications collaboratively available on tablets. If you tap into those skills, both customer satisfaction and overall productivity can skyrocket.
2. Use Innovating Together to make IT a consulting arm to the business. A customer focus and a consulting mindset can result in solutions that are co-created and fit for use. It’s often easier for an end user to convince another end user that a solution is good. Using this approach, we can get many prototypes going simultaneously.
3. Start with analytics in a novel way – maybe something mobile – and develop a high Return on Attention (ROA). Especially when prototyping, an investment is often worthless unless you have attention from interested users. Once you have results somebody cares about – once you have their attention – funding further investment is straightforward.
4. Get started. There are many startups now with resources for big data, and there is likely to be consolidation later. Don’t wait on the sidelines for the “perfect” tool. Strive to learn from fast failures to create lasting achievement. Be nimble, avoid big bets, and you’ll be more likely to survive and thrive.

### Flying car future

Making the most of big data requires a strong feedback cycle between human analysts and automated engines – allowing manual manipulation and evaluation of new and evolving data sets, and consistent tweaking of the underlying machine learning, associated models, and results thresholds.

The future appears to be heading toward advanced natural language processing, semantic analysis, and cognitive computing that will likely reduce dependencies on the human operators and scientists. Ambient, continuous analysis, and refinement – with background scenario planning, knowledge engineering, pattern detection. As context, biases, and non-linear relationships are identified through semi-autonomous pattern detection, self-learning will likely continue to build a taxonomy and ontology able to achieve goals in pattern discovery on the first try – without offline intervention or guidance.

Will artificial intelligence and knowledge discovery replace the need for human intervention and judgment? Not anytime soon. That said, consumer solutions like Siri and Google Now are already demonstrating the power of natural language processing – allowing business users to ask conversational questions without a sophisticated knowledge of the human-machine interface. These solutions are limited by the small number of data sources and services available to inform context and content of answers. Fast-forward to similar systems with broad data and service access. When coupled with cognitive machine-based learning algorithms, the potential can boggle the mind.

Which leads us to the real flying car future. One where behind-the-scenes, prescriptive analysis can drive not just decision-support, but transactional execution for an increasing number of business processes. Like the autopilot on the airlines, a host of core services across sales, finance, manufacturing, and customer service functions can take advantage of trusted autonomous processing, creating an autonomic nervous system for the business. Users can shift their focus to a very broad range of information available for a highly specialized domain specialist to explore using voice and gesture controls – where a dizzying combination of machine learning and raw statistical analysis is being delivered across zettabytes of data to smoothly render results in real-time. Think of a symphony conductor – one surrounded by potential relationships and data patterns instead of musicians, allowing insights to be uncovered to refine the automated core, or lead to more significant strategic shifts according to market dynamics.

One byproduct of increasingly autonomous systems is machine ethics and morality. On-the-fly decisions will require a combination of pre-scripted business rules and tolerance thresholds, and confidence for the machine to interpolate desired action for unprecedented encounters. A self-driving car may need to make a decision: do I hit the child who darted in front of me or swerve into oncoming traffic?<sup>12</sup> The soul of the machine will inform the character of the business as much as it will drive its performance in the market.



## Where do you start?

Information has been the white whale of the last decade of IT investment, but few organizations have mastered core data management across the enterprise – much less higher-order disciplines like business intelligence, visualization, or advanced analytics. Does that mean you shouldn't press forward? Hardly.

Coupling data scientists and machine learning with visualization and other data interaction tools can allow timely results with less infrastructure build-out – and gives a higher tolerance for error. Imperfections of data sources and the limitations of machine learning are hedged by intuition and cognitive insights of human counterparts. Technology advances allow for data crunching that would have crippled sophisticated servers just five years ago. Some specific areas to start the journey:

- **Stack the deck.** Don't play without talent. Start with business domain experience – people to help inventory and categorize the information assets at your disposal, understand line-of-business priorities, and work with technology specialists to determine short- and long-term needs.
- **Look to the source.** *Finding the Face of Your Data* begins and ends with data sources. The problem is that those sources are often an unknown quantity. You should understand not only your own data, but also the third-party sources available to supplement and extend your own purview. Open source, governmental, and subscription-based feeds may provide crucial missing links to discover new patterns and insights.
- **Start the clock.** Big data projects can spiral in complexity and scope. Identifying sources, integrating the data, massaging the data, running models, and creating visualizations and reports can exhaust an enthusiastic business sponsor's appetite. Start small – delivering something quickly before the business users lose interest.
- **Manage expectations.** Trying to launch this effort with enterprise-wide plans would likely be daunting. Choose specific domains in which to begin (e.g., customer, product, pricing, risk). Focus on places where your available people are most knowledgeable. Instead of dealing with hypothetical super-sets, focus on tangible, bounded focus areas. Run some experiments to test the data and deliver results. But once the scope has been anchored, don't limit yourself to just one domain. Investigate seemingly unrelated data sets. You never know where an "aha" relationship may be lurking.
- **Good hygiene.** Big data is still data, and you'll still need data disciplines. Core data management, master data management, integration, and stewardship are important – even if only for the small domain slices upon which early initiatives are sighted. This is the structural foundation for future efforts. Enough of a strategic roadmap should be laid out to monitor that short-term enablement is in line with long-term vision.
- **Stay on target.** Before you can determine the right questions to ask, you'll need to illuminate the possible questions that could be answered. Then define relative priorities and associated metrics to assess what changes could be enacted based on insights. Early focus should be on areas that involve no more than first- or second-degree inferential analysis.



### Bottom line

Information as an asset is moving to the forefront of the business agenda. From basic analytics to sophisticated visualization. From taking advantage of big data to pattern discovery and sense-making. Despite many advances, we remain a long way from completely automated discovery and contextual analysis. Machines are very good at finding patterns, but we should still have human analysts – augmented by visualization tools – to determine real meaning and value.

In *Finding the Face of Your Data*, we are building on the foundational elements of previous cycles and trends, while recognizing the importance of balancing people, data, and computing power to discover questions that previously couldn't be answered – or even asked. The goal remains the same: data-driven decision making, with higher speed-to-value.

### Authors



#### Vikram Mahidhar

Director, Deloitte LLP

[vmahidhar@deloitte.com](mailto:vmahidhar@deloitte.com)

Vikram Mahidhar is a Director in Deloitte LLP's innovation group, which focuses on the development of next generation business intelligence products and services comprising big data, semantic intelligence, analytics, and mobile.



#### David Steier

Director, Deloitte Consulting LLP

[dsteier@deloitte.com](mailto:dsteier@deloitte.com)

David Steier leads the Deloitte Analytics Solutions Group. Using advanced analytic and visualization techniques, David's team of specialists help clients across a variety of industries to solve complex technical problems.

### Endnotes

- <sup>1</sup> Kelly, J. *Big Data Market Size and Vendor Revenues*. Retrieved December 11, 2012, from [http://wikibon.org/wiki/v/Big\\_Data\\_Market\\_Size\\_and\\_Vendor\\_Revenues](http://wikibon.org/wiki/v/Big_Data_Market_Size_and_Vendor_Revenues)
- <sup>2</sup> CB Insights. *Big Data Companies Pull In \$1.1B from Venture Capitalists Since Q2 2011*. Retrieved December 11, 2012, from <http://www.cbinsights.com/blog/venture-capital/big-data-companies-venture-capital-fundinc>
- <sup>3</sup> Brian Gentile, *Why Are B2B Social Media Firms So Hot?*, <http://mashable.com/2012/06/19/big-data-myths/> (June 19, 2012).
- <sup>4</sup> ACID: Atomicity, Consistency, Isolation, Durability
- <sup>5</sup> Thomas H. Davenport and D.J. Patil, *Data Scientist: The Sexiest Job of the 21st Century*, <http://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century> (October 2012).
- <sup>6</sup> Michael Scherer, *Inside the Secret World of the Data Crunchers Who Helped Obama Win*, <http://swampland.time.com/2012/11/07/inside-the-secret-world-of-quants-and-data-crunchers-who-helped-obama-win/> (November 7, 2012).
- <sup>7</sup> Stuart K. Card, Thomas P. Moran, and Allen Newell, *The Psychology of Human-Computer Interaction* (United States: Lawrence Erlbaum Associates, 1986).
- <sup>8</sup> Yevgeniy Sverdlik, *Chicago CIO: Big Data for big-city problems*, <http://www.datacenterdynamics.com/focus/archive/2012/10/chicago-cio-big-data-big-city-problems> (October 22, 2012).
- <sup>9</sup> Ariel Schwartz, *5 Outside-The-Box Ideas To Change U.S. Cities For The Better*, <http://www.fastcoexist.com/1680855/5-outside-the-box-ideas-to-change-us-cities-for-the-better>
- <sup>10</sup> Brett Goldstein, *Chicago's Smarter City Transformation*, <http://www.socrata.com/discover/chicago-open-data-webinar-transcript/> (April 26, 2012). Transcript
- <sup>11</sup> Deloitte acquired Recombinant Data Corp. in October 2012. Press Release: [http://www.deloitte.com/view/en\\_US/us/press/Press-Releases/3a04a4722c89a310VgnVCM2000003356f70aRCRD.htm](http://www.deloitte.com/view/en_US/us/press/Press-Releases/3a04a4722c89a310VgnVCM2000003356f70aRCRD.htm)
- <sup>12</sup> Gary Marcus, *Moral Machines*, <http://www.newyorker.com/online/blogs/newsdesk/2012/11/google-driverless-car-morality.html> (November 27, 2012).



# 7 Gamification Goes to Work

## Moving beyond points, badges, and leaderboards

Leveling, point-tracking, and bonuses can recognize and reward desired activity. Leaderboards and progression indicators can steer individuals to the next tier of personal and business performance. Quests and countdowns can shape behavior. It's all part of gamification – and it's having a real impact on businesses worldwide. Gartner predicts that by 2015, 40% of Global 1000 organizations will use gamification as the primary mechanism to transform business operations<sup>1</sup>. Unfortunately, many early efforts never moved beyond tactically layering on points, badges, and leaderboards to pockets of the business. In fact, Gartner predicts that by 2014, 80% of current gamified applications will fail to meet business objectives primarily due to poor design<sup>2</sup>. Gamification's potential is much bolder – systematic adoption within and across the business, tightly integrated with the core systems that drive front- and back-office functions.

Gamification can instill challenge, pay-off, and new perspective into day-to-day tasks, tapping into the same human instincts that have led to centuries of passionate competition and engagement – our innate desire to learn, to improve ourselves, to overcome obstacles, and to win. As business becomes increasingly social, our professional and consumer lives are being built using digital interactions. This momentum can be tapped to augment performance by embedding gaming mechanics into traditional processes. Technology in the workplace can be rewarding, and (gasp) even fun.

Increasing individual engagement in work, team, and outcomes is a common business goal, and games have demonstrated to be one of the most influential teaming and communication activities across generations and cultures. Organizations can harness gaming principles to improve morale, influence behavior, and get stakeholders passionately engaged in everything from finance, sales, HR, manufacturing, and more. Using the transparent rules and boundaries that come with gaming, organizations can accentuate compliance and leading practice adoption by aligning game objectives with the desired outcomes of the enterprise. Or, more powerfully, to have gaming mechanics almost imperceptible to the user, who instead find themselves incented to find new ways to team, to work, and to drive business outcomes.

One important ingredient in gamification is identifying potential users and related use cases, then understanding their progress paths – the narratives that define growth from novice to star performer. That way, incremental challenges can be defined to steer personal growth. In games, the next desired action is usually clear. How can that same thinking be applied in business?

Gamification provides immediate indications of goal achievement. A move in a game provides real-time feedback. You find your king in check. You rescue the princess. You collect the last gold coin and complete the level. In many businesses, however, much of the activity on the part of employees and customers will likely go unnoticed or, if noticed, unrewarded.

Many games also have a social element. Similarly, gamification efforts should tap into social connections to spur engagement through competition and provide support channels. Increasing communication, collaboration, and sharing ideas across your social business should be an explicit objective of gamification.

Finally, gamification should be taken seriously. Game design is as much art as science, requiring a balanced blend of game mechanics and a deliberate approach to defining “win” conditions that can work across the range of personality types in your stakeholders. Ill-conceived initiatives will likely have reverse effects – where the focus shifts to gaming the game itself. In one scenario, that means employees may take advantage of loopholes or poor game mechanics. In another, they may actively sabotage the game or their “competitors,” who are most likely colleagues.

Historically, gamification has been consumer-driven. M2 Research reported that in 2011, 91% of the gamification market was consumer-driven and only 9% enterprise-driven<sup>3</sup>. But it can be much more – systematic, integrated, and a driver of *enterprise* engagement. And in fact, M2 Research estimates that by the end of 2013, game design within the enterprise will become the dominant segment of gamification<sup>4</sup>. The essence of gamification is a new way of thinking, designing, and implementing solutions – and it may even force you to start thinking of your employees, partners, and suppliers as consumers. Many organizations are already moving to put gamification to work. Move now to secure your place in the winner's circle.



## History repeating itself?

Games, challenges, and competitions have been consistent features of human society. Similarly, companies have long tried to meet objectives like engaging clients or encouraging employees to work together more effectively. Despite a compelling case for how embedding gaming mechanics in business can benefit these corporate goals, the history of effective gamification is just beginning. That's because it is difficult to entrench gamification firmly within the organization. Effective game principles often rely on deep and accurate understanding of internal organizational workings, as well as the needs of customers externally. It's ultimately a cultural change. Overcoming this barrier may be critical in 2013.

	What were the challenges?	What's different in 2013?
<b>Behavioral economics</b>	<ul style="list-style-type: none"> <li>Behavioral economics has caught the attention of a number of industries. Principles include nudge tactics, gradual engagement, and framing. These principles seek to apply behavioral changes based on how choices were presented to people. A limitation of behavioral economics has been not acknowledging the effects of customers' and employees' social networks.</li> </ul>	<ul style="list-style-type: none"> <li>Gamification shifts the focus from just behavior, to behavior and experience. Behavior economics try to affect an outcome. Gamification aims to design a journey that evolves, engages the participant, and tries to create a sense of fun. This ties in well with the general shift from product interface to user experience in the corporate world.</li> </ul>
<b>Early gamification efforts</b>	<ul style="list-style-type: none"> <li>Early gamification efforts focused on single, non-game processes. Common examples were marketing teams using it as a technique to attract and retain customers, or HR using it to supplement performance management processes. However, the number of players and scope of activities that had been monitored and shaped was limited.</li> <li>Data collection is in place in many organizations; many already collect click-level behavior, but it was rarely used to trigger feedback, feed rewards, or guide personal growth.</li> </ul>	<ul style="list-style-type: none"> <li>Gamification seeks to unify an individual's various personae to guide growth, behavior, and engagements. Isolated instances can be effective, but a broader, integrated approach can give a richer view of performance and incentives, and can yield more than incremental improvements.</li> <li>Points, leaderboards, and badges can still be valuable. But first organizations should take a hard look at objectives, processes, solutions, and players – feedbacks and rewards tied directly to the employee, customer, or consumer.</li> </ul>
<b>Process engineering</b>	<ul style="list-style-type: none"> <li>Process engineering shares historic links with systems thinking and management science. Over the years, however, process engineering has often been misinterpreted by management; co-opted by executives to design and enforce processes with austere rule sets that seek to allow them to command and control.</li> </ul>	<ul style="list-style-type: none"> <li>Gamification has the opportunity to increase the visibility of processes within an organization and across its value network. It can incorporate the real experience of interacting with colleagues, customers, and suppliers such that players have a far deeper feel for their roles and the roles of others. It makes visible the competing objectives of various departments and facilitates an equitable outcome. In short, the real system can be made visible. Gamification acknowledges that there are those who would seek to 'game' the system, and includes this in the reckoning.</li> </ul>
<b>Simulation and serious gaming</b>	<ul style="list-style-type: none"> <li>For serious gaming, practitioners in non-entertainment fields saw potential in developing heavy business simulations and war-gaming applications as sophisticated models to emulate complex behavior. However, there is a high barrier to entry, as a serious game is likely only as good as its underlying rules and models. In addition, these simulations are more apt to be point-in-time studies in dedicated, "safe" environments versus integrated with real work processes.</li> </ul>	<ul style="list-style-type: none"> <li>Serious gaming continues to be an effective training and risk management tool for several industries and business functions. However, gamification looks to take gaming principles from the walled garden of a simulation into day-to-day operations, affecting (and understanding) employee and customer engagement, and behavior as business is conducted.</li> </ul>



## Technology implications

As gamification expands, organizations should embed game elements into core systems and processes across the business. This has far-reaching implications – for security and privacy, integration, data, and social platforms. But penetration will not likely be immediate. A layering approach should be applied, where focus and pace of adoption is likely to differ by industry and individual company dynamics.

Topic	Description
<b>Game mechanics platform</b>	The success of game element deployment lives and dies within the design and user experience of the game itself – the underlying rules engine, event monitoring and triggering, and an engaging user interface to drive player behavior. A number of solutions have emerged that provide plug-ins or third-party services for pieces of game elements. Many organizations are also building their own – tightly aligned with policy engines and digital content management systems for consistency and ease of maintenance.
<b>Social business</b>	Games are inherently social. So goes gamified business processes. Integration into collaboration and social enterprise tools is important for internal efforts – sharing motivation, creating support mechanisms, and tapping into existing real-world relationships. Additionally it can circumvent hierarchies to bring diverse teams together to do their jobs differently. Hooks into public social media platforms are equally important – for enterprise connectivity, as well as for authentic interaction with customers and third parties.
<b>Integration</b>	For gamification to truly go to work, it is likely to require deep integration with enterprise systems. Game mechanics are fueled by feedback and rewards – requiring visibility into individuals' day-to-day activities. Exposing transactions and data from underlying ERP, customer, and analytics solutions is a challenge, particularly if gamification will be externalized or centrally managed. Equally challenging is embedding gamification elements into the native logic of current platforms. The challenge for designers is to determine the platforms through which the system or business process will manifest. The complexity can increase for global or multinational companies with language, cultural, market, and infrastructure nuances in each geography.
<b>Cloud and open external systems</b>	With the trend towards hyper hybrid-clouds and open APIs, organizations should have clearly defined policies and governance structures to accommodate flexible application portfolios that embrace gamification. It is likely only a matter of time before customers and staff start to deploy their own applications – bring your own application (BYOA). This essentially gamifies the enterprise application build and deployment process.
<b>Big data and analytics</b>	The current use of badges, virtual gifts, rewards, leader boards, and the social commentary that accompanies the implementation of these game dynamics often results in a sizeable increase in the amount of data that is available both internally and externally for an organization to analyze. You should develop a data taxonomy system that allows meaningful tags. Once established, this data can be used to determine behavioral, business, product, and organizational patterns that – if acted upon – may lead to a more agile organization. The storage, privacy, and accessibility of these large data sets are likely to continue to challenge the CIO and the governance officers within an organization. Finally, what gets measured usually gets done. New business intelligence and analytics capabilities should be stood up for visibility into desired business outcomes – to help fine-tune the gamification elements, as well as to understand the effectiveness of the effort.
<b>Mobile</b>	With the ubiquitous nature of the mobile phone and the adoption of bring your own device (BYOD), workers are often no longer desk-bound. This opens up multiple new dimensions of game dynamics that can be incorporated into a business process, ranging from geo-tagging, video, photo-embedding, and social plug-ins. Security over what is published, stored, and recorded becomes critical for brand, reputation, and potentially business continuity. Mobile also allows advanced techniques like appointment dynamics, where specific actions or rewards are available only if a user is in a predetermined physical place at a specific time <sup>5</sup> .

## Lessons from the frontlines

### Gamifying digital exhaust

Institutional knowledge often lives in the minds of employees. Bluewolf, a global technology consulting firm, uses gamification principles to entice employees to build and maintain a public brand, encourage knowledge sharing, and help capture experience.

The company surveyed employees to understand how they interacted with social media, and from that information built the #GoingSocial Portal. The goal of the portal is to educate employees on how to use the major social networks more effectively, and to instill principles for managing online reputations.

Employee profiles display biographical information and include the “digital exhaust” of social media activity, such as Twitter updates and links to authored content (blog posts, white papers, etc.). These profiles were made public on the company’s website to showcase the knowledge of employees to clients. To monitor that profiles were created and maintained, the company gamified the use of pack profiles by awarding points to employees for activities such as publishing a blog post. Since collaboration was a critical driver for creating #GoingSocial, each pack profile was linked to social media analytics. Employees could earn points based on popularity of content through clicks and comments. Specific challenges also netted points, such as the “spread the word” challenge to get employees to use their networks and link them back to the website. Employees received badges and recognition for completing challenges, and if they accrued enough points, they could cash in for rewards such as gift cards, lunch with the CEO, tickets to conferences, and flight upgrades<sup>6</sup>.

One important aspect of the #GoingSocial program was the use of employees to build Bluewolf’s thought leadership. In the first four months of the program, website traffic from social channels increased 100% and social traffic increased 20%. The company saw a 57% increase in collaboration through their internal social network, and has been able to maintain this level of collaboration through continued use of game principles.<sup>7</sup>

### Now serving: an engaged customer base

Engine Yard, a Platform as a Service (PaaS) company, needed to increase customer service support to their growing client base. They decided to use gaming mechanics to build a self-help community. Engine Yard had previously been responding to customer issues through support tickets, a process that was slow. Customers often had to wait up to a full day for a response – which didn’t help the company with the additional goal of getting them engaged in using their knowledge base and forums.

The first step completed was centralizing the features customers needed to answer questions, which was accomplished by moving user forums and documentation into the customer support portal. To monitor that customers would continue to use and refresh the portal, Engine Yard implemented gaming technology to reward users. By integrating gamification elements with the customer support portal, customers can earn achievements for specific behaviors, such as searching the knowledge base, reading articles, and creating topics. Users can also complete missions – where a series of tasks are grouped together – to win special rewards or badges. As users accumulate achievements or complete missions, they can level-up in experience. For example, if a user completes the mission of finding bugs, they can move from ‘lightning bug’ to ‘fly swatter’ status.

In the first two months of the gamification effort, Engine Yard saw a 240% increase in people who were able to find answers to their questions within one minute of starting their search<sup>8</sup>. Customers got what they needed in a timelier manner, without relying on Engine Yard’s support team – which was then able to focus on more complex issues. On average, the number of tickers per customer dropped by 20% and the support team reduced ticket response time by 40%<sup>9</sup>.

### Ready conference one

Box, a cloud-based file sharing platform, was planning a day-long training conference for employees, but they wanted to avoid the typical parade of slide presentations. To help ensure that employees absorbed the information and were able to network among their peers easily, Box decided to gamify the conference.

Over a two-week period, Box developed a platform-neutral website that would appeal to their young workforce. Participants used their mobile devices to earn points for answering questions correctly during training sessions. In addition, Box wanted to promote networking because fast growth had made getting to know new and current employees difficult. The company created an app to award points for answers to trivia questions about colleagues, such as “who was a White House intern?” Employees were grouped into teams to promote collaboration, and rankings were displayed in real-time on a leaderboard with prizes going to the top individuals and top teams<sup>10</sup>.

After the training, Box was able to use the data gathered in the game to further support operations, improve communications, and reinforce areas where employees incorrectly answered content-driven questions. The website also included a survey as part of the game, which gave Box valuable feedback about the event<sup>11</sup>. By thinking creatively about the conference environment, Box was able to transfer knowledge and prevent presentation fatigue.



## My take

**Gabe Zichermann**

CEO

Gamification Co

In the technology industry, where I've spent my career, ideas are processed quickly – from “hot new idea” to “everybody has this figured out already” and the range in between. Gamification has become a buzzword, for sure, but many enterprises have just scratched the surface of its potential. Over the next year, gamification is likely to morph from a tactical to a strategic concept.

Currently, gamification has specific uses, such as for help desk or sales process enablement. In the next phase, gamification will likely be used to fundamentally reengineer human capital and the way systems interact with people. The hard work – the strategizing – hasn't been done yet.

Inside enterprises, training and development folks are the early adopters of gamification, in response to employee dissatisfaction with training programs. You can easily picture it. Someone says, “Everybody in the conference room for software training!” – with nothing but blank stares as people file in.

For a gamification strategy to ignite, it has to begin with the C-suite asking this strategic question: “How do we rewire what we do?” The CIO should be the first strategic actor, as he or she has the enterprise software problem to solve.

Gamification both resembles and differs from other new movements, such as social. Many early gamification startups gained tremendous momentum with their energy, capital, and entrepreneurs, shaping the discussion at the outset. Larger software companies may not be nimble enough to engage early, so they may acquire companies to enter the space. The buzz-and-investment cycle can raise awareness and enterprise experimentation – first tactically, and eventually strategically. It's a familiar story, playing out anew.

What's different about gamification? Many large companies were already well down the path of home-grown gamification projects before they really knew what they were doing. It wasn't until

the gamification community started to coalesce – and the term entered the popular parlance – that people spoke up and said, “I've been doing this for years.”

One dynamic that has fueled gamification vendor growth is the “double dip”: a company engages with a focus on customers, and then, seeing results, it engages the vendor again to employ gamification programs for its employees. This is great for software companies, but it's another reason enterprises should start thinking about gamification strategically.

As you embark on that strategic journey, an important thing to understand is the demographic trend underpinning gamification. Millennials are dramatically different. They likely won't accept a boring approach to work, tolerate delayed gratification, nor work for the same company for 15 years – unless they have thoughtful rewards, progress, and incentives.

Working as both a strategy and a tactic, gamification has demonstrated itself to be cost-effective and scalable, disciplined, and metrics-oriented. Organizations can adopt it and receive significant benefit, notably strategic competitive advantage when it comes to recruiting, retaining and training top talent, and gaining customer adoption. These early leaders are also increasingly turning gamification into a source of revenue, a trend I see represented by the case studies in leadership presented at the industry's main conference, GSummit<sup>12</sup>.

With all this in mind, I see a new role emerging in the enterprise – partly tied to gamification but also going beyond it. We call this role The Chief Engagement Officer: a leader focused on engagement science, techniques, and design disciplines to engage employees and customers of the organization. And if it isn't a single person, it will likely be a cross-functional working group.

It bears reminding, however, that we are still in early days. New insights based on gamification and, more broadly, behavioral psychology are just now emerging. Are there limits to where gamification can take us? We'll find out – but today, the trend line heads straight up.

### Flying car future

The future of gamification will likely blur virtual personas and reality – where much of what we do is tracked, measured, and linked to personal and professional rewards. At present within our corporate lives, a very small part of what we know and what we do is used to measure relative worth and performance within the organization. What is evaluated is often done, so through the subjective lens of a supervisor or manager, it is likely removed from the vast majority of our daily routine. Gamification allows for granular, consistent, and real-time feedback, rewards, and growth – driving consistent individual and workplace improvement.

Some will likely fiercely resist dissolving the boundaries between work/life balance. Privacy issues are important. Just because something can be measured, should it be? And who should control disclosure to your employer, to your insurance provider, or to local authorities?

Finally, refereeing and adjudication in gamified business process will likely become a full-time function. People may bend rules to “win,” outright cheat, be accused of cheating, and accuse others of cheating. How will disagreements be resolved, and how will game dynamics evolve over time? But then again, how does it really differ today?



### Where do you start?

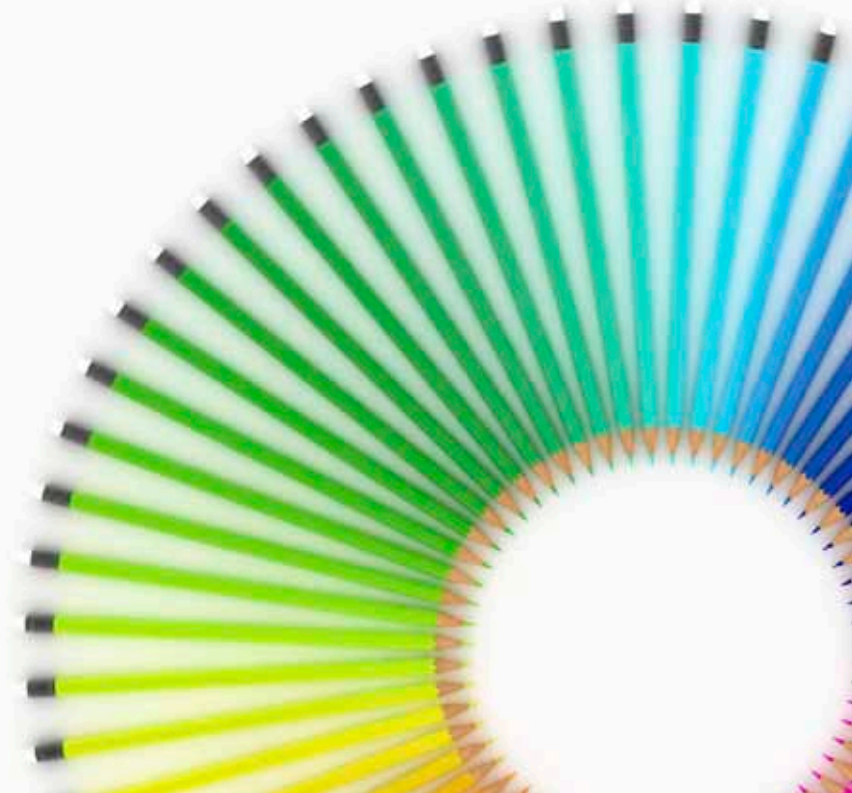
The building blocks for gamification are familiar – starting with business objectives, desired outcomes, and understanding the audience. For gamification to truly go to work, however, it is important to understand the inner workings of the organization, process interdependencies, and behaviors, including the interplay between human actors and the underlying technologies. Some initial steps:

- **It's a social business thing.** Like any social business investment, the first step is to clearly articulate the business problem to be addressed. Next, identify the social networks relevant to that objective – spanning both the virtual and the physical world. Third, explore incentives that may cause the networks to engage on that objective. Finally, explore opportunities to greatly decrease traditional constraints with the methods, technologies, and media of gamification. These steps may seem pedestrian, but many failed gamification efforts start with a specific game mechanic or platform they want to introduce – not the “why,” “for whom,” and “so what.”
- **Design is a team sport.** The construct of a game will likely touch on individual incentives, operational and organizational goals, analytics, end-user interface, and underlying IT systems. A multi-disciplinary team is needed to represent these dimensions – including social scientists, marketers, game designers, line-of-business managers, data scientists, back-end systems engineers, and architects. Business systems are complex and have causation. When applying game dynamics to a business process or the business as a whole, designers should understand the complexity of the rules that govern the organization – and how to increase interaction and engagement with audiences. The game design itself should maintain clarity of its benefits to users – as well as to the organization.

- **Measure, tweak, and iterate.** Intangible effects and lack of measurement criteria have led to the perceived failure of some early gamification efforts. Benchmark current performance, measure the output once the application is activated, and don't hesitate to revise assumptions, approaches, or tools in response. Almost nothing kills an innovation in business process like failure to move the initiative beyond the pilot implementation. There are three dynamics which need monitoring. First, be sure to maintain momentum within the “interest corridor.” If the game dynamics are too difficult, the participant will likely lose interest and disengage. The same is true if the dynamics are too simple.

Secondly, by gamifying a process, the organization will likely have access to a significant amount of new data that was previously unavailable. Through a feedback mechanism, you may have insights on how to adapt in real time. If harnessed correctly, organizations will likely be able to refine their strategy in real time.

Finally, keep an eye on long-term objectives. Tweaking, measuring, and enhancement should be an ongoing process – not a one and done effort. Be sure to fine-tune the model. But more importantly – to keep players engaged over time. What will keep this process exciting and interesting after the first level or achievement is reached? And how will the data that is analyzed regarding behaviors and outcomes cause one to rethink the rewards, incentives, and recognition?





### Bottom line

Badges and leaderboards have their place, but they are a part of a larger, more interesting opportunity. By following vendor leads, companies may become stuck with isolated one-off concepts, incrementally improving a small part of the business. Instead, view this as a chance to rethink what a gamified business looks like from the ground up. Understand who you're trying to engage, what motivates them, and how gamification can change the way they look at – and work with – the organization. Don't hit the snooze button, or the opportunity to put gamification to work in your business may be game over.

### Authors

#### Doug Palmer



Principal, Deloitte Consulting LLP  
dpalmer@deloitte.com

For as long as “social” has been a phenomenon in the business world, Dr. Doug Palmer has been helping clients leverage its potential for competitive advantage. Doug currently leads the Social Business practice, advising clients in areas related to social media, collaboration, gamification, and the adoption of emerging technologies.

#### Andre Hugo



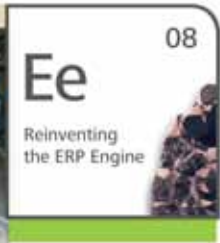
Director, Deloitte Digital RSA  
anhugo@deloitte.co.za

As Director of Deloitte Digital in South Africa, Andre assists clients in leveraging disruptive digital technologies, enabling them to cost effectively deploy new business models and access new markets or revenue streams.

### Endnotes

- <sup>1</sup> Gartner, Inc., “Gartner’s Top Predictions for IT Organizations and Users, 2013 and Beyond: Balancing Economics, Risk, Opportunity and Innovation”, Daryl C. Plummer et al, October 19, 2012.
- <sup>2</sup> “Gartner Says by 2014, 80 Percent of Current Gamified Applications Will Fail to Meet Business Objectives Primarily Due to Poor Design,” Gartner, Inc. press release, November 27, 2012, on the Gartner, Inc. web site, <http://www.gartner.com/it/page.jsp?id=2251015>, accessed December 20, 2012.
- <sup>3</sup> M2 Research, “Gamification in 2012 Market Update - Consumer and Enterprise Market Trends,” May 2012, Page 9, accessible via <http://gamingbusinessreview.com/wp-content/uploads/2012/05/Gamification-in-2012-M2R3.pdf>, accessed December 20, 2012.
- <sup>4</sup> M2 Research, “Gamification in 2012 Market Update - Consumer and Enterprise Market Trends,” May 2012, Page 16, accessible via <http://gamingbusinessreview.com/wp-content/uploads/2012/05/Gamification-in-2012-M2R3.pdf>, accessed December 20, 2012.
- <sup>5</sup> “Gamification” on the Gamification Wiki web site, <http://gamification.org>, accessed December 9, 2012.
- <sup>6</sup> Ginger Conlon, *Inbound marketing success is child’s play for Bluewolf*, <http://www.dmnews.com/inbound-marketing-success-is-childs-play-for-bluewolf/article/267774/> (November 9, 2012).
- <sup>7</sup> David Kirkpatrick, *B2B Social Media: Gamification effort increases Web traffic 100%, employee collaboration 57%*, <http://www.marketingsherpa.com/article/case-study/gamification-effort-increases-web-traffic#> (May 2, 2012).
- <sup>8</sup> Gregory Love and William Platt, *Gamification for Enterprises: How Badgeville Gamifies*, [http://fora.tv/2012/06/21/Gamification\\_for\\_Enterprises\\_How\\_Badgeville\\_Gamifies](http://fora.tv/2012/06/21/Gamification_for_Enterprises_How_Badgeville_Gamifies) (June 21, 2012). Video
- <sup>9</sup> Case Study: “Engine Yard”, <http://www.badgeville.com/casestudy/engineyard>
- <sup>10</sup> Landis, D. Guest Post: *Preventing Death by PowerPoint*. Retrieved December 11, 2012, from <http://www.bunchball.com/blog/post/825/guest-post-preventing-death-powerpoint>
- <sup>11</sup> Whitepaper: “Enterprise Gamification: The Gen Y factor”, <http://www.bunchball.com/resources/enterprise-gamification> (registration required)
- <sup>12</sup> See: <http://www.gsummit.com/>





# 8 Reinventing the ERP Engine

## With a super-charged engine, businesses can drive new performance

ERP is no stranger to reinvention, overhauling itself time and again to remain relevant through disruptive waves of client/server and the Web. Its formula for success? Expanding the very definition of Enterprise Resource Planning (ERP) from financials to manufacturing to supply chain management to CRM to HR and more. Beyond new functional capabilities, it has also expanded into information – business intelligence, reporting, and analytics allow organizations to build predictive models. For a while, the focus was extensibility through integration platforms, application servers, and orchestration suites. Today's momentum is around ubiquity. Organizations are striving to make ERP accessible in many ways – on your mobile device, in your collaboration suite, or in your social streams.

This manifest destiny of the service catalog has been an important part of ERP's strategy, and will likely continue. But that's not our trend this year. Something else has been happening, with roots closer to Moore's Law than to Porter's Five Forces. The engine of ERP is being reinvented.

The underlying drivetrain of ERP had remained constant throughout its past evolution – on-premise, licensed, single-tenanted software stacks built on transactional relational databases, running on enterprise-class machines in dedicated data centers. This time, though, that drivetrain is being changed, with torque-rich updates at the infrastructure, data, and application layers.

In-memory, column-based databases allow sub-second response time for the many complicated queries. Distributed computing, virtualization, and cloud-based infrastructure are driving total cost of ownership (TCO) reduction, a shift from physical to logical, and from fixed to variable expense. Appliances and engineered systems have led to impressive levels of integration across the hardware and software stack – making the landscape not only potentially easier to manage, but yielding higher price/

performance efficiencies. Multi-core and massively parallel CPUs, advent of cell CPUs, incorporation of advanced GPUs, durable and affordable solid-state storage, more efficient network infrastructure, and hybrid memory architectures allow real-time processing of torrents of both structured and unstructured data, and real-time mobile enablement of complex back-office transactions. Even the crown jewels are not exempt. Some enterprise applications themselves are being rewritten with columnar data, multi-tenant, subscription-based services. These architectural shifts reflect the changing role of ERP from a process-driven to an event-driven mindset.

The traditional industrial-grade engine of ERP made sense in the days of rigid, automated, highly standardized business processes. Processes are a sequence of activities – planned, predictable, repeatable, and often inflexible. They should have a big, powerful engine to drive scale and efficiencies on well-defined tracks.

The new event-driven world still uses processes, but they have become flexible, agile, and configurable based on the event that just occurred – within the core, or at the edge. The old engines could not process billions of events at near real-time speeds and allow this maneuverability. Thus the reinvented engine – a necessary condition for real-time processing of disparate data at competitive price points.

But that doesn't mean every part of the business should be reimagined – or that the upgraded foundational layer doesn't have benefits in the old way of doing things. Many organizations may find themselves with a mix of the new and the old engines – taking advantage of point technical upgrades for "locomotives" to help drive efficiencies, and making strategic bets on agile "sports cars" to reshape business as usual. Unprecedented speed and flexibility – coupled with ERP's ongoing functional expansion into information domains and ubiquitous mobile access – are together leading to the end game of hyper-productivity. In either case, the reinvented ERP engine is at the heart of the investment – and revitalizing one of the business' most strategic (and expensive) assets: the enterprise application suite.

### History repeating itself?

The evolution of ERP has been featured as a technology trend in previous years, so why is the retooling of the engine headline-worthy news? And how is it different than previous reincarnations?

	What were the challenges?	What's different in 2013?
<p><b>Best-of-breed enterprise applications<sup>1</sup></b></p>	<ul style="list-style-type: none"> <li>• Extensibility was about easing integration into/out of the core ERP – and accommodating distinct other services to fulfill an end-to-end process. It was a sensible approach – especially with innovative edge offerings emerging in the cloud. But it is essentially a “surround strategy” for the core ERP offering – providing neither efficiency nor cost gains for the core, nor offering avenues for innovation of how business transacts those core processes.</li> <li>• The leading approach promotes an increasingly heterogeneous footprint – featuring a host of operating systems, hardware configurations, databases, application servers, and software packages. The efficiencies of integrated, engineered systems were nearly impossible to realize.</li> </ul>	<ul style="list-style-type: none"> <li>• Aggressive acquisitions have simplified the vendor landscape, though new players are emerging in targeted domains. Consolidation provides the opportunity for disparate services from different modules to share the same operating environment and take advantage of the engine’s reinvention.</li> <li>• Heterogeneity is not going away, with most organizations landing on a hyper-hybrid cloud model<sup>2</sup> – a mix of on-premise license based software and cloud services. But opportunities to improve cost performance of the core remain – as do chances to introduce some significant changes to how the business operates by taking advantage of the geometric improvements in the engine “power to weight” ratio.</li> </ul>
<p><b>End of the “Death of ERP”<sup>3</sup></b></p>	<ul style="list-style-type: none"> <li>• The prediction that large, global, complex organizations would likely retain existing on-premise, license-based traditional ERP software for the core of their business has demonstrated itself to be true. But while the processes are served by the traditional ERP model, they do not have to remain stagnant on the traditional engine. Opportunities for new efficiencies and improved TCO may have been ignored in the philosophy of preserving the predictability and stability of the core.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineered systems, in-memory computing, and a broader shift to cloud infrastructure and platform enablement of parts of the core ERP landscape have the potential to improve cost and performance characteristics of the preserved core.</li> <li>• <i>Ad hoc</i> and <i>de jure</i> standards adoption of concepts such as MapReduce reflect the shift to address not just the application tier but also the data tier, both integrated with and parallel to the in-suite capabilities.</li> <li>• Importantly, there are opportunities to introduce the newly overhauled engine without open-heart surgery of existing core processes – either by focusing on adjacencies to the transactional layer (e.g., big data or analytics extensions to core financials, manufacturing, supply chain) or by driving adoption in the non-production parts of the solution landscape (stage/test/development environments, or potentially even phasing the new engine into disaster recovery instances).</li> <li>• 10x or even 20x performance improvements at the data, transactional, or analytics tier can be translated to inverse levels of cost savings for a given workload. This may allow ERP nodes to be deployed in more granular and agile fashion around the globe.</li> <li>• The black box nature of engineered systems may signal a return to the days of the AS/400 systems administration being an extra duty for the payroll supervisor or shop floor manager.</li> </ul>

### Technology implications

In a world of standardized rigid business processes, ERP engines were built to be industrial-grade: high transactional scale; pools of dedicated processing resources to deal with sporadic large, long-running batch cycles; racks of spinning discs to manage production volumes (and silos of tape to house data archives); expensive active-active redundant system landscapes at multiple locations for fault tolerance and disaster recovery; infrastructure procured to handle edge cases of volume, concurrency, and growth. All pulled efficiently by the big locomotive engine along set rails. The new world looks different at each layer of the stack, with implications to the rest of your IT portfolio.

Topic	Description
<b>Virtualization</b>	Virtualization plays an important role at the compute, storage, operating system, platform, terminal, and application levels. Many vendors’ reinvented ERP engines allow for more advanced virtualization approaches than organizations may have previously encountered, moving above the infrastructure and OS layers into the platform and application space, and promoting cross-hypervisor portability of workloads. Monitoring and management tools should be updated for visibility and control over the new footprint. Orchestration is the next frontier, and governance is important to guide adoption, preempt instance sprawl, and enforce policy infringements discovered via monitoring and environment maintenance.
<b>In-memory solutions</b>	Conventional ERP solutions (transactional and informational) have been dependent on physical disc, throttled by input/output calls and separate resource-intensive cycles for data retrieval, synthesis, and analysis. In-memory solutions shift the data from physical bits on spinning disc to logical units living in rapid-access memory (RAM). With the data universe in cache, querying, aggregation, and processing can be dramatically improved – both in response times for traditional requests, and in the ability to process more complicated queries across a much wider data domain. Today in-memory is often used for analytics, but several vendors are looking to extend their reach to transactional processes. A shift to include column-oriented database engines supports the analytics query improvements and offers interesting new potential for design of the transaction processing. New ERP architectures are leveraging large memory segments to store and retrieve large portions of the core database, thus reducing the I/O required to retrieve data from disk.
<b>Integrated infrastructure systems</b>	Appliance-like solutions providing integrated solutions across the compute, storage, networking, and management stacks. Advantages include certified interoperability, consolidating monitoring and maintenance solutions, a potential decrease in required benchmarking and testing, and – for some vendors – the ability to take advantage of new technologies for timely, secure, low-latency connectivity between the layers of the infrastructure stack and communications backplane.
<b>Unstructured data</b>	Sometimes lumped under the header of “not only SQL” (NoSQL), the new ERP backbone can reconcile the need for schema-based relational databases for transactional records with the ever-growing importance of semi-structured and unstructured data. Data disciplines need to adapt to an inevitable mix of structured and unstructured data – affecting data architecture (including semantic relationships, correlation, and context), data stewardship (cleansing, upkeep, and archiving), and data governance (metrics, ownership, and oversight).
<b>Integration</b>	Beyond the growing functional heterogeneity of business processes being fulfilled by a collection of leading products and solutions, there is also potential for foundational heterogeneity as organizations find themselves migrating their ERP engines over time. This creates an even greater sense of urgency for integration capabilities to orchestrate the interaction of services and data, inside and outside of the organization, across a changing collection of subscribers and providers.

## Lessons from the frontlines

### ERP at light speed

A global glass and ceramic manufacturer wanted to consolidate multiple ERP applications to centralize their global operations and create a more reliable infrastructure to support their global manufacturing.

In the past, this kind of ERP infrastructure was built by acquiring hardware components, often from multiple vendors, and spending months integrating them to operate as a single cohesive unit. For this manufacturer, a pre-integrated, engineered solution was adopted instead. Rapid deployment of the infrastructure helped accelerate the implementation of the underlying ERP application as well, shortening the schedule from months to weeks in comparison to typical systems implementations. Once the hardware arrived at the data center's loading dock, the system was up and running in two days, greatly reducing installation time of the system.

With the single integrated system, the company has reduced maintenance needs and lowered the total cost of ownership. And with performance improved by a factor of 15 times over the legacy system, they are able to process orders in a more timely manner, execute demand planning reports more efficiently, and alter their supply chain processes in real time. Instead of focusing their technology and experience on managing complex IT systems, they can focus on the innovation that defines performance in their operations – and respond more effectively to meet changing market needs.

### A roadmap for improved performance<sup>4</sup>

Garmin, a leader in navigation and communication products, wanted to reduce the cost and increase the performance of its business-critical systems. One of the company's specific goals was to reduce the cost of ownership of supply chain and demand management systems that were processing 13 million queries and 30,000 batch jobs and reports each month. Management also wanted to fix reliability issues with Garmin Connect, which supports the company's fitness segment, processing 40 million queries per week. In addition, Garmin wanted to build a foundation to support aggressive year-over-year data growth, reduce unplanned system outages, and provide timely system and data recovery should an outage occur.

To realize these objectives, Garmin deployed two massive-memory database machines. Consolidating four production databases and 20 non-production databases led to maintenance and energy cost savings, with database performance increasing up to 50%. Even as Garmin Connect's customer traffic grew by 400% – with a subsequent data expansion from three to 12 terabytes – planned and unplanned database outages were also reduced. Storage area network backup times were cut in half, and the time required to duplicate Garmin's largest database was reduced from 8 days to 10 hours. In addition, Garmin was able to more accurately forecast demand, efficiently process orders, and effectively support just-in-time manufacturing.

### Answering the big data call

The wireless carrier market is a fast-moving industry with customer churn a concern of providers. To stay competitive, one wireless carrier wanted to gain a greater understanding of their customers to improve their marketing efforts and retain their current customer base. However, the company faced challenges with the ability to provide timely, actionable information and analytics with their existing technology systems.

The company decided to implement a scalable, analytics solution to provide customer insights in near real-time. In-memory technology supports data processing and analysis within seconds – taking advantage of the engine of next generation ERP systems. One of the carrier's marketing goals was to increase the number of customers upgrading to smartphone data plans. But understanding if customers responded to service offers took up to one week. The carrier's new platform shortened the time to 15 minutes, allowing the company to make more timely decisions on marketing offers. Generating other reports went from 10-15 minutes to 10-15 seconds. The marketing team is now able to run on-demand searches allowing them to interact with the data to discover new insights. The new system can also run analytics over 24 months of historical data, versus the previous system's three month window. This allows the marketing team to improve the accuracy of their predictions.

The results in the marketing department have encouraged the company to explore other areas for potential implementation of in-memory computing and analytics efforts – including mobile offerings to allow executives to access information on the road. By reimagining the capabilities of modern enterprise systems, this wireless carrier can deliver greater value to its customers and shareholders.



## My take

**Larry Frey**

Chief Information Officer

EnPro Industries

This trend brings out the technologist in me and takes me back to my system programming days. But it's really the business implications that are important to me today – a better/faster/cheaper ERP engine allowing the business access to more and perhaps different capabilities. The underlying technology aspects – appliances, engineered systems, in-memory architectures, etc. – should be kept “underlying.” If technology innovations (the new engine stuff) make my primary job delivering business value easier and more responsive, I'll take the time to assess and invest. Otherwise? Just keep the hood closed.

Having said that, I do appreciate any trend that can enable me to spend less time and energy on the question, “What is the next server we should buy?” or, “How do we make all of these pieces perform together?” and, instead, to spend more time answering, “How do we fulfill the new business requirement that generates revenue at a low cost?”

At EnPro, each of our business divisions operates in a way to effectively serve their customers. Each has its own set of products, customers, and suppliers. It doesn't make sense for all six divisions to operate a single ERP solution, as each one needs different things from ERP. Part of our growth strategy involves targeted acquisitions, which presents additional opportunities.

We've organized IT to respond to that. One team concentrates on commodity technologies, and the other focuses on business solutions. The business solutions team is not distracted by geeky architecture stuff, is primarily business analysts versus programmers, and concentrates on the importance of external experience and resources to deliver leading-edge solutions.

In addition, we prioritize our investment first into “orthodox” capabilities, which enable core operations of the company. My first goal is to deliver and maintain the orthodox solutions so that our company continues to operate like a well-oiled machine. Going beyond orthodox is not often required to achieve operational excellence. Then, on top of our orthodox capabilities, we may gain further competitive advantage by investing in “unorthodox” capabilities – those advanced or emerging technologies that allow us to deliver more to the business using targeted, leading-edge solutions. It's important to note that it's not only about faster or cheaper; it's also about better and easier.

Appliances and engineered solutions keep me from having to reinvent the wheel every time. They take advantage of what we call the “power of plenty” – an externally fueled marketplace of experience and innovation on which we can call. While it may be a little “back to the future” in terms of one-stop shopping, at the end of day I want to write one check for a solution that should work and perform.

My advice? Make sure you can deliver the table stakes before diving into the latest innovation. Focus on the needs of your business and bring in external experience when you need it. Take advantage of the emerging technologies that are able to enhance performance. Don't make a decision based on “cool” in-memory, engineered systems, or other technology factors alone. And, importantly, do whatever it takes to deliver value to your organization by delivering game changers – giving your business a competitive advantage.

### Flying car future

ERP's recent history hints at where the industry will likely stand in five years. Pushes in the areas of usability and ubiquity are likely inevitable. Enterprise data and transactions will likely be available in many areas – with presence, but also with context. The former will likely become well-traveled ground, focused on access to ERP functions from mobile, social, and collaboration channels. The latter, context-awareness, is where the reinvented ERP engine becomes critical.

Advances in data compression, storage and memory costs, and distributed computing will likely allow real-time processing and analysis of internal and external data feeds – allowing action to be taken on intelligent signals gleaned out of torrents of noise. The cost of not monitoring physical operations is beginning to eclipse the cost of introducing sensors and actuators across assets – from facilities and equipment, to supplies and finished goods. Location awareness, digital identities, and the growing automation of business operations allow fine-grained knowledge of who's doing what, where. And social business' growth across the enterprise shines a light on who knows what and who knows whom. The nexus of these forces provides context to inform each action taken, each query answered, and each analytical model.

ERP's supporting infrastructure will likely allow for multi-tenant public cloud, cloud-based dedicated appliances (virtual private), and on-premise appliances for solutions in their catalog – as well as options for in-memory versus disc-based solutions. Vendor consolidation will likely continue, but a handful of players may remain, touting competing platforms for owning the new world of broad enterprise enablement.

Perhaps the most significant change? ERP is shifting from strict process automation based on scale and repeatability, to the orchestration framework for an agile, adaptable set of often-changing events. Pieces of the business will likely rely on highly automated, autonomous, predictive, and prescriptive analytical models. Others will likely rely on human insight and intervention, where tools are there to help knowledge workers visualize and explore complex or sensitive data. This presents a much different scale problem – where advanced intelligence potentially should be deployed against feeds, and is accessible by employees. Today's backbones would likely either crumble under the volume, or be financially untenable if conventional horizontal and vertical growth strategies were followed. Hence the need for a fundamentally different engine – built for outside-in integration, expecting unpredictable and intermittent growth, and capable of handling the exploding volumes of data and service interactions.





### Where do you start?

ERP can be a sensitive topic in many organizations. And for good reason. Significant financial and political capital has been spent in getting to today's current state, with personal careers made (and lost) based on the outcome. It is likely the biggest single part of the IT landscape – influencing a big percentage of IT spend, and involved in an even bigger percentage of the business' operations. Reinventing any part of ERP should cause pause, and will likely draw scrutiny.

But that doesn't mean it shouldn't be broached. Vendors already positioning for the next potentially disruptive wave – one where TCO is transparent and hyper-competitive and ubiquity is expected. Markets are being displaced by companies where old problems are getting solved in new ways, new questions are getting asked and answered, and new businesses are being explored. Here's what you can do to prepare:

- **Experiment at the edge.** Explore opportunities to adopt revamped ERP engines in areas that surround your core transactional layer – business intelligence, analytics, or non-production landscapes. Additionally, use the adoption of the revamped engine to introduce new disciplines that may have immediate business impact, like creating new capabilities around unstructured big data to improve customer sentiment or sales force effectiveness.
- **Experiment at the core.** Explore opportunities for running core workloads on much less gear, making hot/hot and distributed self-healing architectures more practically affordable. Similarly, performance leaps in run times offer opportunities to rethink traditional limitations on batch windows, run book sequencing, and even business cycles. If forecasting, close-the-books, or MRP runs are 10x or 20x faster, how might you rethink your business processes to create advantage?
- **Version hygiene.** If you have hedged against technical upgrades and are generations behind the latest versions, now's the time to get compliant ahead of a business agenda that may require the new engine to fulfill the vision. Pure plumbing upgrades are possible. You can also take advantage of the need to touch the core to reach new features and potential – speed, ubiquity, and flexibility.
- **Evangelize.** Become the change agent of the "so what" by asking what the business can do differently and how the organization's mission can be better served. Understand the implications of the "what" and "how" so you don't oversimplify the migration effort or overpromise the expected outcomes. Vendors and partners can provide scenarios and benchmarks of potential business impact because of the foundational changes. Competitor and cross-industry examples are good, but rarely does something compare to a handful of impactful use cases from your own business.
- **Come to terms with competing viewpoints.** Today's leading vendors are placing nuanced but different bets. SAP on extensibility and ubiquity. Oracle on convergence and integration. The various cloud players on edge disruption bleeding into the core. Each is valid, and likely to achieve goals in the mid-term – and market conditions are unlikely to settle the debate and force anyone's hand. Which leaves the onus on the organization to gain visibility into vendor roadmaps, articulate their own business' vision into similar terms, invest where alignments are clear, and make intelligent bets where there is uncertainty.



### Bottom line

ERP's reinvented engine improves the process-driven ways of old, and enables the event-driven possibilities of tomorrow. Overhauled technologies allow cheaper and timely passage along the well-worn tracks of your existing automated processes. But technological breakthroughs suddenly mean industrial-grade performance can be coupled with maneuverability. This gives you more than efficiency and cost gains; it allows the underlying business problems to be approached in new ways. It allows access to data more efficiently, leading end-users to ask additional questions and explore new ways to exploit their ERP's data – and unlock the potential of their information.

Of course you can rationalize your infrastructure and application footprint. But the real questions are more strategic. What would you do differently if you could close your books in seven seconds instead of seven days? How would your sales strategy change if thousands of store managers could be individually executing daily sales forecasts<sup>2</sup>? What could you learn from real-time monitoring of the social-sphere interactions around your industry? The new ERP engines give you the tools to answer these questions and more.

### Authors



#### Bill Allison

Principal, Deloitte Consulting LLP  
wallison@deloitte.com

Bill Allison serves as the Consulting Global Technology Services leader, responsible for the delivery of full life cycle technology services to clients. He has more than 25 years of experience in the analysis, design, and implementation of information systems, systems strategy, and business process improvement.



#### Richard Kupcunas

Director, Deloitte Consulting LLP  
rkupcunas@deloitte.com

Rick Kupcunas is a Director in Deloitte Consulting LLP's Technology/Oracle practice. He is recognized as a technology and knowledge leader with respect to Oracle database, infrastructure, integration, and application server technologies.

### Endnotes

- <sup>1</sup> 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 4.
- <sup>2</sup> Additional information is available in Deloitte Consulting LLP (2012), "Tech Trends 2012: Elevate IT for digital business", <http://www.deloitte.com/us/techtrends2012>, Chapter 5.
- <sup>3</sup> 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 5.
- <sup>4</sup> Case study: "Garmin International Inc. Improves Database Performance up to 50% by Consolidating onto Hardware and Software That's Engineered to Work Together", <http://www.oracle.com/us/corporate/customers/customersearch/garmin-international-1-exadata-ss-1561598.html>
- <sup>5</sup> Chris Kanaracus, *SAP unveils HANA-powered performance management apps in the cloud*, [http://www.pcworld.com/article/262062/sap\\_unveils\\_hanapowered\\_performance\\_management\\_apps\\_in\\_the\\_cloud.html](http://www.pcworld.com/article/262062/sap_unveils_hanapowered_performance_management_apps_in_the_cloud.html) (September 10, 2012).



# 9 No Such Thing as Hacker-proof

## You've been breached, or you soon will be. Now what?

Who can forget that great line from the movie *Field of Dreams*? "If you build it, they will come." It's an inspiring incentive of future rewards to be reaped for challenging work today. But in the realm of cyber-threat defense, it is also an unfortunate likelihood. If you build something of value, others will likely come to steal it. No matter how you secure your environment. No matter how many redundant walls or how many futile moats you have.

Cyber criminals are often well-resourced and potentially even nation-state sponsored. They can be highly capable, methodical, and patient – and their tactics keep shifting. To be sure, "smash and grab" attacks still occur, with hackers compromising a system to steal something like credit card data, and then moving on. Now, though, there is growing occurrence of the "long-term dwell." Adversaries can gain undetected access and maintain a persistent, long-term presence in critical IT environments, operating below the radar of the victim organization's cyber team.

The motivation? There are sophisticated, lucrative markets for monetizing a wide range of stolen intellectual property. Symantec placed the cost of IP theft to United States companies at \$250 billion a year, with global cybercrime costing \$114 billion annually – \$388 billion after factoring in downtime. McAfee estimates that \$1 trillion was spent globally for remediation.<sup>1</sup> Before he retired as the Executive Assistant Director of the FBI (and its lead agent on cybercrime), Shawn Henry told congress of one situation in which an American company had all the data associated with a 10-year, \$1 billion research program copied by hackers in one night. General Keith Alexander, head of the military's cyber command and Director of the National Security Agency, called the continuing, rampant theft of intellectual property and trade secrets "the greatest transfer of wealth in history."<sup>2</sup> Cyber criminals are often targeting research and development data, marketing and product strategies, intellectual property, and other business-sensitive information for financial gain and competitive advantage. In federal and critical infrastructure industries, their ultimate goal is often to disadvantage our national security.

Meanwhile, many organizations may have a false sense of security, perhaps even complacency, resulting from their investments in non-agile security tools and processes they have relied on for years. Yet firewalls, antivirus, intrusion detection systems (IDS), and intrusion prevention systems (IPS) are increasingly less effective as attackers leverage encryption and other innovative techniques to evade them. Many companies are failing to detect long-dwell cybercrimes in their IT environments and misallocating limited resources to lesser, more generic threats. Basic security blocking and tackling is valuable, but is in no way sufficient. Richard Clarke, former cyber security advisor to the White House, believes "every major company in the United States has already been penetrated<sup>3</sup>."

Organizations across many industries need to up their games. That can require changing the lens through which they view cyber risk – not relying upon traditional security controls revealing tell-tale signs of an effective attack – but leveraging intelligence and advanced techniques to *identify the coming threat and proactively respond*.

Move from reactive to proactive. Leverage intelligence from both internal and external sources. Use forensic and analytic techniques to drive timely decision-making and proactive responsiveness to hostile activities in the network. Mine intelligence for improved incident attribution to develop a deeper understanding of the origin of the attacks and track specific adversaries to enhance future risk analysis. Quickly detect, isolate, and contain an event when it occurs.

And remember: *there is no such thing as hacker-proof*.

Does that mean we should surrender the fight? Of course not. There have been and will likely be breaches. Move forward boldly, advance your tactics to meet those of the adversary, and contain the risk against your valuable assets.

### History repeating itself?

Network security and data protection have been the focus of information security programs for many years. Additionally, compliance initiatives such as SOX, PCI DSS, GLBA, and HIPAA<sup>4</sup> have further stressed the need for access controls, vulnerability management, security patching, and more. In response, many companies have deployed a wide range of technologies to protect themselves and meet compliance requirements. Many started by hardening the perimeter defense. That wasn't sufficient, so investments were begun – though not always completed – to build defense-in-depth. Many companies have more recently started to address issues of insider threats and advanced persistent threats. Again, not always with the rigor needed.

Today the cybercrime landscape represents a set of highly specialized criminal products and services that are often able to target specific organizations using sophisticated malware exploits and anonymization systems, which routinely evade many of the security controls established over the last several years.

	What were the challenges?	What's different in 2013?
<b>Threat detection and intelligence</b>	<ul style="list-style-type: none"> <li>• Hardening and detection efforts were focused on the perimeter – expecting threats to emerge from external forces.</li> <li>• Breach response was event-based, triggered when systems or people detected the effective exploit of an identified vulnerability.</li> <li>• Standing budgets for security remained small, in some cases dwarfed by the sum of costs for fire-drill responses to incidents.</li> <li>• Companies didn't focus on understanding their information assets, collecting and correlating threat intelligence, and devising solutions commensurate with risk. Too many security agendas were (and in many cases still are) based on generic, non-specific threats.</li> <li>• Security technology focused on broad signature-based network security and endpoint protection solutions to identify attacks, combat viruses and worms, and protect against incidents.</li> </ul>	<ul style="list-style-type: none"> <li>• Detection systems are likely insufficient – as are prevention systems. Tactical skills should change. The focus now should be on understanding internal and external activities – integrating today's threat detection into an event management system and intelligence-driven approach.</li> <li>• It is not enough to protect tomorrow from yesterday's threats. Solutions should be put in place to understand and mitigate risks – not just as compliance checks. Cyber attacks and security breaches are increasing in frequency and sophistication, with discovery usually occurring well after the fact, if at all.</li> <li>• Security should now be viewed as a smoke detector instead of a fire truck, with proactive agendas based on risk and value. Incident response should be required, but is not likely the primary objective of the Chief Security Officer (CSO).</li> <li>• Many organizations are initiating "cyber-threat intelligence" assessments to understand how information is managed internally – and valued externally. They are also deploying continuous sense-and-adapt approaches that leverage next-generation network security technologies.</li> <li>• Tools and processes should move from managing incidents to recognizing patterns, allowing automated identification, prevention, and closure of risks.</li> <li>• Current perimeter-intrusion detection, signature-based anti-malware, and antivirus solutions often provide little defense and are becoming obsolete. For example, cyber criminals now often use encryption technology and malware production toolkits to avoid detection.</li> </ul>
<b>Cyber criminals</b>	<ul style="list-style-type: none"> <li>• Drivers for security attacks were fairly straight forward (notoriety, financial gain, etc.), widely dispersed (targets of opportunity), and often quite noisy – the digital equivalent of the "smash and grab."</li> </ul>	<ul style="list-style-type: none"> <li>• Increasingly there appears to be a nexus between cybercrime and a variety of other threats including hactivism, terrorism, industrial espionage, and cyber warfare. Commercial and federal organizations are likely targets of choice, not chance.</li> </ul>

## Technology implications

Building tomorrow’s intelligence-driven, proactive cyber program requires a systematic enterprise-wide approach – equal parts governance, change management, process redesign, and technology. The people and operational impacts can be significant. But so are the required underlying technologies needed. Organizations should build out capabilities to defend, detect, model, predict, respond, isolate, and recover in order to prepare for today’s advanced threats. What does a modernized, battle-ready cyber-threat program look like?

Topic	Description
<b>Identity, Credential, and Access Management (ICAM)</b>	<p>Core security requirements continue to be critically important, building from traditional enterprise identity, credential, and access management solutions. Authenticating users, assets, and systems; managing entitlements; and encrypting data at rest, in flight, and in use. These requirements (and others such as vulnerability, asset and patch management, etc.) help form the foundation of technical risk management and are table stakes in developing an advanced cyber-intelligence capability. Many leading organizations are also integrating logical and physical security – another step towards one unifying view of authorization and entitlements for individuals, and a more holistic treatment of the threat landscape.</p>
<b>Threat awareness</b>	<p>Automated network and malware forensic analysis are needed, as well as intelligence collection from honeypots or other ‘baiting’ operations. This can require dynamic and continuously evolving threat registries, as well as dedicated security analysts that can correlate external threat intelligence with internal threat analysis based on knowledge of the business.</p>
<b>Security Information &amp; Event Management (SIEM) solutions</b>	<p>Detailed logging and SIEM are also table stakes when it comes to building advanced cyber-threat management capabilities. The stream of event data, when combined with internal and external intelligence, can allow correlation, analysis, and subsequent detection of threats that would otherwise go unnoticed.</p> <p>Additionally, a SIEM solution can serve as a fundamental building block in developing a threat defense architecture and related automation to monitor the evolving threat landscape, and take precautionary measures before incidents occur.</p> <p>When incidents do occur, event data is critical in order to triage what has transpired and respond in a timely manner.</p>
<b>Unstructured and semi-structured inputs and intelligence</b>	<p>Develop sources for intelligence internally and externally. Leverage open source and commercial intelligence regarding known botnet signatures, malicious IPs, hostile domains, malicious hash values, etc. Harvest data from internal systems via SIEM, as well as directly from infrastructure components (e.g., DNS lookup data, DHCP lease information, and proxy logs).</p> <p>Invest in data collection and analysis solutions – allowing automated crawling and information parsing from web logs, email, RSS readers, social networks, and transactional system activity. Use cyber analytics – linked to threat rosters and known business risks and fraud issues – to identify potential areas of escalating risk.</p>
<b>Cyber intelligence</b>	<p>Render the intelligence actionable – add cyber forensics and analytics to develop a cyber-threat intelligence database and analyst portal with integrated threat response playbooks. Improve the quality of the intelligence through analyst contribution and intelligence tagging. Cultivate strong relationships with security researchers, law enforcement, and CERT teams to share information and extend your network – which can be critical during investigation and take down. Finally, address cyber logistics – secure supply chain, operational security, personnel security, and facility security – as the fourth leg of the cyber-intelligence approach.</p>
<b>Asset protection</b>	<p>A combination of change, device, rights, and content management is needed. For physical assets, focus on the need to maintain inventory, monitor usage, and promote firmware and operating environment updates to servers, desktops, mobile devices, and equipment. For digital assets, classify, encrypt, and protect structured, semi-structured, and unstructured content from being accessed or manipulated.</p>

### Lessons from the frontlines

#### To the thief go the spoils

The oil and gas industry in the U.S. has found itself the target of several multi-year cyber-attack campaigns that targeted business leaders in order to compromise field exploration and bid data, as well as field production information. The tactics have varied in small ways but appear to follow the same general approach:

- Conduct direct attacks against Internet-facing systems, as well as spear phishing (targeted email attacks) of managers and officers in the company, in an effort to gain access to systems that open the door to the broader network
- Once access is gained, the attack deploys additional tools to harvest user credentials and identify sensitive data on network drives and in email. This can be done in ways that avoids detection and remains in the network for months or even years
- Once sensitive information is obtained, the data is extracted from the organization's network without raising alarms or suspicion

#### The weakest link

A number of effective recent attacks often started not with the victim organization itself, but a 'trusted' partner or service provider. Adversaries will often profile an organization, including its business partners and service providers upon whom the company relies, looking for the path of least resistance. For example, the easiest way into a corporate network may be through a partner's VPN connection. Though a partner is often seen by the victim as a trusted source, such partners may not have the same degree of protection in place and little 'real world' visibility into their partner's security posture.

Additionally, cyber security companies themselves are now coming under attack, as adversaries seek to compromise the products that organizations use for protection. Without transparency into the broader ecosystem, organizations may be missing important parts of the security picture.

#### "Free" IP

There's no shortage of examples of advanced persistent threat (APT) breaches at technology product companies, where intellectual property is a recognized asset – and a primary hacker objective. In 2009, Operation Aurora victimized more than 30 companies, including some of the largest technology brands known today<sup>5</sup>. What were the adversaries after? Product source code – a rich target for multiple reasons:

- Stealing the time, talent, and money invested in requirements gathering, design, development, and refinement of a commercial software product
- Preparing a competitor to get to market first, leveraging what you already built, without the time or cost associated with IP development
- Embedding hostile code within the application and then pushing the code 'into the wild' to compromise a larger number of companies

For a software product that is widely used, access to source code may allow the adversary to identify generally unknown vulnerabilities and leverage that knowledge to attack a broader array of companies.







## My take

**Gary Warzala**

Chief Information Security Officer

Visa

When it comes to information security, our adversaries have become much more sophisticated and greater in number, from nation-states exercising rogue diplomacy across thousands of miles, to “hacktivists” infiltrating systems in the name of political demonstration. Moreover, many have moved away from “smash and grab” tactics and now try to embed themselves in networks indefinitely, leading information security professionals to put a focus not only on *preventing* breaches before they happen, but on *detecting* them – as quickly as possible, not in weeks or months or even years after the fact.

Despite this ever-changing landscape, we continue to hear about new technologies purporting to “hacker-proof” corporate systems, evoking the century-old claim – tragically debunked – that the Titanic was unsinkable. So rather than measure ourselves against what is an elusive goal, it is incumbent on each of us in the security profession to raise the level of skills within our organizations on a daily basis – by strengthening the technological and cultural infrastructure to thwart our adversaries, anticipating threats on the horizon, and empowering our team to decisively address breaches in security as they happen.

The first step is strengthening barriers to entry into our organizations – not by deploying whatever new security technology is the flavor of the day, but by focusing on the basics and doing them well. The initial compromise in 90% of breaches requires a low-to-medium skill level, which demonstrates the importance of having the security fundamentals firmly in place – such as a secure network, timely patching, robust logging and monitoring, strong access controls, and end-user education and training designed to enhance the culture of security within your organization.

Second, with a stronger culture and security infrastructure in place, protecting an enterprise requires a clear understanding of who the adversaries are, their methods and objectives, and what assets they may target. Since there is no way to spend your way to total security, this “threat profile” can help organizations make risk-based decisions about where they can invest in security programs and where to introduce controls to mitigate the most likely threats. Periodically update this threat profile to keep up with new innovations and processes throughout your organization, which often introduce new risks that should be considered and managed.

Finally, but most importantly, surround yourself with a team of security professionals that are as skilled and passionate as your organization’s adversaries – a team of “digital first responders.” Time and time again organizations often deploy security technologies assuming that, on their own, the technologies will somehow protect their enterprises. But without capable security professionals who can articulate the threats and risks, identify the detective and preventative controls, and work to operationalize effective solutions, these technological investments are often in vain.

While there is no “hacker-proof” silver bullet, if history is any indicator, the ingredients for success likely lie in the day-in, day-out focus on improved security skills within our organizations. By having a dedicated focus on the fundamentals of information security, anticipating threats on the horizon, and developing the best talent possible, enterprises can be prepared for the worst.

### Flying car future

Today's cyber-threat solutions are reminiscent of clinical medicine. Under the Hippocratic oath of "do no harm," much attention is placed on identifying symptoms, triaging to root cause, and judiciously prescribing treatment based on the specific diagnosis.

But defending digital assets will likely only become more challenging. Enterprise networks are expanding to include partners, customers, suppliers, and mobile employees. A growing number of mobile devices are in play. Cyber security teams are challenged with funding, talent, and resource constraints. And with the coming explosion of sensors, biometric, and nanotechnologies, the threat landscape will likely only become more complex and increasingly difficult to understand and control.

As a result, cyber intelligence of tomorrow should operate more like the human immune system. When a foreign agent is detected, antibodies are produced, with white blood cells attacking the intruder. The body accelerates blood flow and increases temperatures to create an inhospitable environment for the threat. The identity of the threat is not always known – nor its source, intent, or potential ultimate effect. The body isolates and attacks the intruder, destroying the foreign party, and extends its own protections to be prepared if the threat reemerges.

A similar approach can be envisioned in our cyber landscapes, with systems that won't need to identify something in absolute terms to know that it should not be there. Detected incidents would be quarantined, allowing the threat to be understood and traced – cyber forensics from a controlled environment where business risk has already been contained. More extreme measures may become mainstream – shutting down network segments or purging afflicted systems. Fingers may be lost to save the arm – which may require a vastly different mindset than today's perimeter defense approach to security and privacy, where the "answer" is sometimes still higher castle walls and deeper moats.

This more aggressive posturing may lead to more aggressive counter-attacks. With incident sources attributed, cyber-offensive techniques may emerge further – retaliatory measures in response to verified malicious actions. This will likely require some cross-national body to adjudicate disputes and keep the cyber peace.

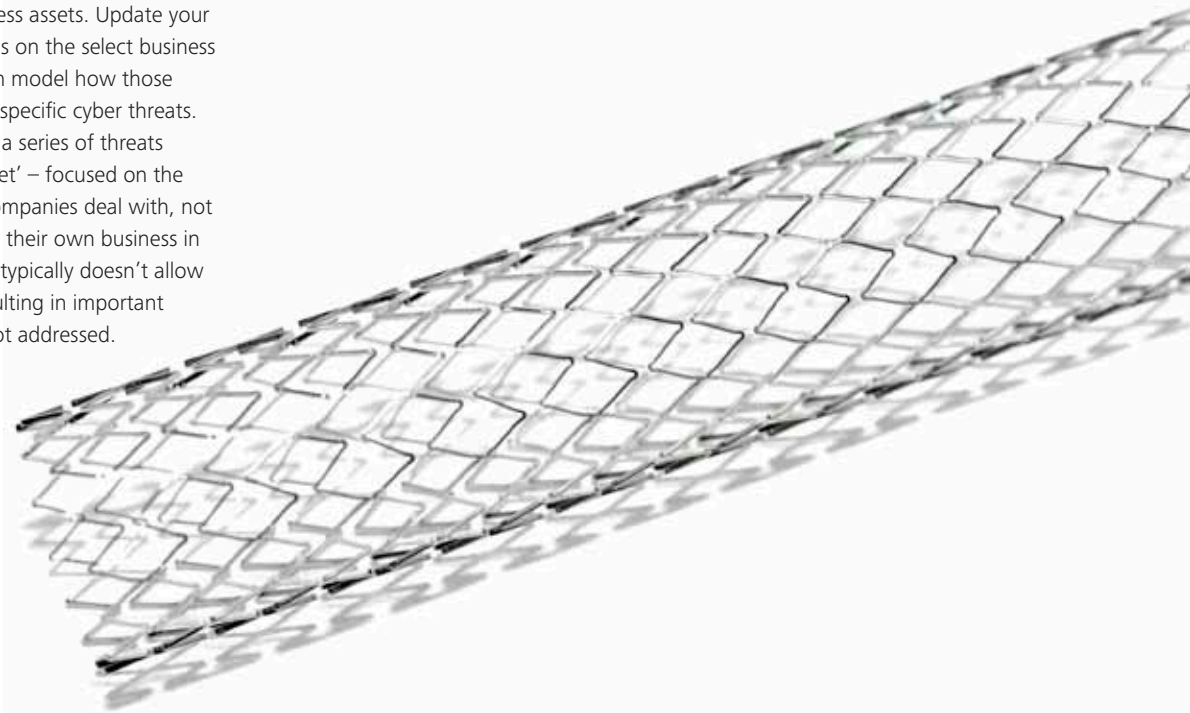
With the blurring of national and economic concerns, a more sophisticated, aggressive posture towards cyber assets suddenly becomes a global concern – and, unfortunately, one whose import will likely only grow over time.



## Where do you start?

Secretary of Defense Leon Panetta says that America's critical infrastructure systems have been breached already<sup>6</sup>. This is not defeatism – it is a catalyst to spark the recognition that the world has changed. Organizations should view cyber intelligence as a strategic priority. The threat is real. We are under attack. Yet the impact can be lessened by a systematic response. Potential places to start include:

- **Identify the jewels.** Understand the external cyber-threat beacon of your organization – the market value of stolen intellectual property in your industry and, specifically, in your company. Tap into external intelligence to understand the broader threat landscape. Then look inward and catalog your high-risk assets – either because of high potential for monetization if stolen, or critical business impact if breached.
- **Know your baseline.** Assess your current cyber-threat management program across specific dimensions in order to identify strengths and gaps. Include intelligence capabilities, emerging threat research and modeling, brand protection, and network and malware forensics.
- **First things first.** Develop a roadmap for enhancing your target threat defense architecture, prioritized based on perceived risk of high-value business assets. Update your threat assessment process to focus on the select business risks to the organization, and then model how those business risks may be affected by specific cyber threats. All too often organizations group a series of threats together into a single 'cyber bucket' – focused on the general security threats various companies deal with, not those use cases that could impact their own business in a material fashion. This approach typically doesn't allow for targeted mitigation, often resulting in important threats to the business that are not addressed.
- **Don't forget the business case.** Based on the program assessment and updated threat scenarios, articulate the business case for enhancement of the cyber-threat-management program. This seems like an obvious step, but many information security teams look at their mission as a pre-ordained mandate. Clearly articulating the reasoning, justification, and business impact can breathe new life into the security organization, and increase likelihood of funding to expand capabilities.
- **Think "extend," not "replace."** Seek to gain the most leverage out of the technologies and processes *already in place* before building or implementing new ones. It is likely that there are a number of existing SIEM capabilities that can be enhanced, as well as the ability to dig additional functionality and intelligence out of tools including endpoint protection, vulnerability assessment and patch management, content monitoring, data loss protection, intrusion prevention, and core network services. Determine which pieces of the target threat defense architecture are in place today – or could be with additional tuning and integration, versus net-new technology and process needs.



### Bottom line

Cyber security may sound technical in nature, but at its core it is a business issue. Any company's competitive position and financial health may be at stake.

Business and technology leaders need to engage in effective dialog about what the business values most, how the company drives competitive advantage, and which information and other digital assets are the most sensitive. Brand, customer trust, and strategic positioning are at risk.

This new reality requires a new attitude around security and privacy. Anticipate and prevent when possible, but be ready to isolate and encapsulate intrusions to reduce impact. There may be No Such Thing as Hacker-proof, but there's a chance to reduce your cyber beacon, be less inviting to attack, and proactively establish outward- and inward-facing measures around your most valued assets.

### Authors



#### Kelly Bissell

Principal, Deloitte & Touche LLP

kbissell@deloitte.com

Kelly Bissell leads Deloitte's Information & Technology Risk Management and Global Incident Response practices. In his 25-year career, he has led numerous projects ranging from Breach Forensics, Cyber Security, and Identity Management, to Privacy and Data Protection, and IT Risk Management.



#### Kieran Norton

Principal, Deloitte & Touche LLP

kinorton@deloitte.com

As the U.S. Cyber Threat Management leader, Kieran Norton assists clients in transforming their current efforts into advanced cyber threat management programs, building threat defense architectures, cultivating actionable cyber-threat intelligence, and responding to cyber incidents.

### Endnotes

- <sup>1</sup> Emil Protalinski, *NSA: Cybercrime is 'the greatest transfer of wealth in history'*, <http://www.zdnet.com/nsa-cybercrime-is-the-greatest-transfer-of-wealth-in-history-7000000598/> (July 10, 2012).
- <sup>2</sup> Richard A. Clarke, *How China Steals Our Secrets*, [http://www.nytimes.com/2012/04/03/opinion/how-china-steals-our-secrets.html?\\_r=0](http://www.nytimes.com/2012/04/03/opinion/how-china-steals-our-secrets.html?_r=0) (April 2, 2012).
- <sup>3</sup> Ron Rosenbaum, *Richard Clarke on Who Was Behind the Stuxnet Attack*, <http://www.smithsonianmag.com/history-archaeology/Richard-Clarke-on-Who-Was-Behind-the-Stuxnet-Attack.html> (April 2012).
- <sup>4</sup> SOX: Sarbanes-Oxley  
PCI DSS: Payment Card Industry Data Security Standard  
GLBA: Gramm-Leach-Bliley Act  
HIPAA: Health Insurance Portability and Accountability Act
- <sup>5</sup> Kim Zetter, *Google Hack Attack Was Ultra Sophisticated*, *New Details Show*, <http://www.wired.com/threatlevel/2010/01/operation-aurora/> (January 14, 2010).
- <sup>6</sup> J. Nicholas Hoover, *DOD: Hackers Breached U.S. Critical Infrastructure Control Systems*, <http://www.informationweek.com/government/security/dod-hackers-breached-us-critical-infrast/240008972> (October 12, 2012).



# 10 The Business of IT

## After reengineering the rest of the business, IT's children deserve some shoes

With shrinking budgets and increased scrutiny over ROI, many IT organizations are under pressure for bottom-line company earnings. This manifests in two ways: enabling the business to be more effective in the market (IT for the business), and driving efficiency of IT operations (*The Business of IT*). To do both, IT organizations should automate and integrate their core processes and services, just as they've done previously for manufacturing, finance, and sales.

When it comes to supporting business performance, IT has a thirty-plus year record of delivering what's needed. First it was the transition from manual processes to technology-driven solutions. Then, from standalone systems to integrated offerings. And now, IT is striving for similar returns from information, digital, and innovation.

In the years ahead, however, IT's value proposition will likely increasingly be shaped by how well it addresses its second mandate: to improve operational efficiency in the business of IT itself.

For many CIO organizations, operational efficiency is not a rosy story. As IT has focused on making line-of-business operations efficient, the underlying mechanics of the business of IT have often been ignored. From how solutions are built and managed to how resources are deployed to how accomplishments get measured and reported, it's time for CIOs to invest in their own shops. That means driving tools to capture, report, and manage their full portfolio of projects, vendors, and resource pools – across planning, implementation, and ongoing operations.

It won't be easy. The large information technology organization of today is a complex beast, with many ad-hoc processes, few externally defined standards and leading practices, and limited integrated software suites. Indeed, business unit leaders and the C-suite can seldom list the services IT provides, much less quantify the value of IT spending. This runs the risk of making IT seem less relevant to the business over time. Internal IT organizations will likely be competing more with third-party democratized IT services and cloud-based solutions that promote themselves to be feature rich, timely, and cheap – and in many cases, rightly so.

The good news? There are finally tools in the market that can support running IT like a business. Just as ERP had wide-reaching effects on people, process, and underlying technologies, the impact of these tools on IT's operating model can be significant.

Not surprising, the maturity of these tools doesn't approach "ERP-levels" of suite delivery and integration. It may even seem more like pre-manufacturing resource planning (MRP) "roll-your-own." But the potential benefit is likely worth the investment – not only in driving down costs and managing risks more effectively, but in positioning IT as a business partner in provoking and harvesting disruption in the Postdigital era.

### History repeating itself?

Twenty-plus years ago, many businesses invested in solutions to automate pieces of their domains. They did so in pockets of functionality: accounts payable, general ledger, inventory planning, fixed assets, warehouse management, and accounts receivable. IT was asked to not only automate the silos, but also to drive integration to MRP, which became ERP, once HR and financials were added to the mix.

Now the business of IT has started an awakening – where loosely governed processes and operating models are finding point solutions to manage parts of the IT service catalog. But we’re still at the cusp of a truly integrated approach to managing the business of IT.

	What were the challenges?	What’s different in 2013?
<b>IT Service Management (ITSM)</b>	<ul style="list-style-type: none"> <li>Engineers are instructed to strictly adhere to process, end-to-end. Well-intentioned processes can trump sound business judgment, as compliance is seen as the end, not the means.</li> <li>ITIL and CMMI processes are intentionally rigid, standard, consensus-driven, and risk averse. Moreover, their scope and importance are difficult to understand both inside and outside the IT organization, making it hard to define and measure their value.</li> </ul>	<ul style="list-style-type: none"> <li>A well-defined service catalog is an important part of the overall management of the business of IT, but likely not sufficient in and of itself.</li> <li>Aligning IT services objectives and outcomes to actual business results is gaining favor, extending the underlying standards with meaningful context for the business.</li> <li>Tools have evolved that allow management of day-to-day tasks aligned with IT service standards. Instead of burdensome adjunct processes, ITSM standards are baked into development and run operations.</li> </ul>
<b>Project Portfolio Management (PPM)</b>	<ul style="list-style-type: none"> <li>Improved understanding of investment requests, budget prioritizations, and in-flight projects focused on managing scarce resources while prioritizing work efforts. PPM gives significant visibility, but requires other complementary efforts to define and enforce delivery models and management standards, gain real-time visibility into the metrics affecting IT operations, and close the loop between monitoring and continuous improvement.</li> </ul>	<ul style="list-style-type: none"> <li>IT business process management has evolved as a super-set of related capabilities to manage many facets of the business of IT. PPM is one dimension, but it should be coupled with efforts to automate and standardize operating and delivery model, as well as financial, service, and lifecycle management.</li> </ul>
<b>Enterprise Systems Management (ESM)</b>	<ul style="list-style-type: none"> <li>From device-centric management information base monitoring to instrumented systems and “SPOG” (single pane of glass) approaches, the ESM focus has taken a siloed view of operations. While monitoring became fairly sophisticated, root-cause analysis and resolution remained manual and experience-driven.</li> </ul>	<ul style="list-style-type: none"> <li>IT BPM (business performance management) takes a broad view of planning, managing, and reporting the business of IT.</li> <li>“ERP for IT” addresses automation (today) and integration (future) of important IT business cycles, including finance, demand management, application management, infrastructure, sourcing, workforce, service management, and end-user computing management.</li> </ul>



### Technology implications

Organizations that want to increase operational efficiency and product and services quality should deploy systems and applications that allow them to run IT as a business. The goal is to have integrated applications and consistent data definitions that support the use cases. Yet no one vendor offers an ERP-like, all-in-one solution. Some are making progress in integrating and filling the gaps of their existing product suites, but choices are limited and not yet integrated. CIOs should consider integrating IT support tools from different leading vendors, whether the applications are hosted in-house, in a SaaS model, or by an outsourced IT service provider with their own enabling IT applications.

As you can see in the table below, the path forward recapitulates the history of automating the finance function: first transactions, then analytics, then (now) access and usability.

Topic	Description
<b>Data standardization</b>	Standard data definitions are fundamental to IT process integration and supporting technologies. IT has grown up over decades with competing frameworks and so-called “standards” for demand planning, services catalog development and management, operations management and reporting, and chargeback. To realize the potential of efficiency, data dictionary reconciliation and integration are often required. A data model for the IT function is invaluable.
<b>Cross-vendor application interoperability</b>	Along with data standardization, multiple vendors’ applications should be able to exchange data, synchronously or asynchronously. These applications may sit inside or outside of a company’s firewall. Or, in the case of multiple outsourced IT service providers, there would be multiple sources for IT management data that should flow up, down, or sideways.
<b>Analytics</b>	A common data repository may be required for reporting and analysis. This will likely pull in data from multiple sources in a normalized and reconciled way (with common language and consistent metrics), and also be the repository for storing historical data for trend reporting.
<b>Mobile</b>	Options for using mobile applications in support of the business of IT are possible with a more integrated technology footprint. Today, some software vendors offer dashboard-like reporting for mobile devices of IT management information tied to their toolsets. But mobile computing will likely emerge to drive inter-process support, speeding up management decisions in ways that are rarely seen today.
<b>Enterprise architecture</b>	Enterprise architecture becomes the Rosetta Stone for how the underlying, interdependent IT assets work together. Architecture should serve as the context switch between the various components running the business of IT, monitoring downstream outcomes are being met throughout portfolio, project, lifecycle management, and ongoing operations.
<b>Believable service-based costing</b>	By integrating IT financials with service management, project management, and procurement, an IT organization can define total cost of ownership for an application, appliance, or service. Many leading IT organizations depend on IT financial management products that support a complex set of allocations. But to make this work, data standards, a services catalog, and the instrumentation of processes and infrastructure are often required – allowing granular, low latency visibility into the usage and performance of resources.

## Lessons from the frontlines

### Visualizing change

Business Technology Services (BTS) at Ontario's Workplace Safety and Insurance Board defined a bold vision for its future: to become the best IT organization in Canada's public sector. To accomplish this, CIO John Hill is leading his \$80 million division to change everything from cultural DNA and delivery methods, to supporting processes and more. In short, they are changing how they deliver on the business of IT.

BTS is adopting cutting-edge tools and processes in a program that combines elements of Agile, Kanban, and Lean methods. Borrowing from Eric Ries' *The Lean Startup*<sup>1</sup>, leadership instituted a "build-measure-learn" loop for quick evaluations of the viability of a given strategy. Once BTS determines that a strategy is effective, they begin to scale out the approach.

Integrating Kanban with Agile and Lean allowed employees to visualize current and upcoming workloads, using visual cues to represent obstructions (such as defects). Teams physically gather around the Kanban board, forming quality circles to triage and resolve issues. They also use bi-weekly stand-ups to review tickets and issues, brainstorm closure, and share lessons learned. Achievements spread Kanban from a handful of teams to the entire enterprise – resulting in real-time delivery that models the project lifecycle from inception through production. Leadership can visualize the enterprise's portfolio of projects and easily identify risks, issues, and obstructions across projects. The approach has torn down organizational silos and shifted people to co-located delivery pods, staffing team members to lines-of-business based on required skills and technical specialties.

In six months, BTS has seen significant organizational and cultural changes with positive results: increased transparency and collaboration within BTS and with the business; timely delivery of tools and services; improved ability to redeploy resources against shifting business priorities; and a 40% improvement in delivery lead time and throughput. This goes to show that reengineering the business of IT can produce real business results.

### Incremental change, big results

The IT division of a global investment and securities firm is responsible for managing a billion-dollar portfolio of projects. But in an environment where business priorities often change, its ability to effectively budget for, and allocate resources to, the appropriate IT projects was limited. To address this challenge, IT set out to align expenditures and resources with business priorities. Their approach? Breakdown existing silos within the IT division and integrate processes to flex with the goals of the business.

Using phased implementation, IT teams selected four initial business processes to improve – project demand management, in-flight project portfolio management, resource management, and forecasting. They used a prototype to test concepts within a single business unit, an approach that increased buy-in and preparedness across the organization. Using lessons learned from the prototype, they selected and piloted an enterprise tool to facilitate roll out of the improvements. They traded an annual budgeting approach for a three-month rolling forecast; implemented a project portfolio management dashboard to assist executives to make better prioritization decisions; and streamlined the resource pipeline to fulfill business needs. The result? Integrated processes with supporting tools that provide improved budgeting accuracy, improved decision making, and a 30% re-appropriation of project resources from less value-aligned in-flight projects to more pertinent needs.

### Balancing the IT checkbook

When the corporate finance department of a global entertainment company needed to justify IT costs, the CIO was asked to produce usage-based cost allocations to each business unit within each country of operation. The CIO implemented a process and solution to track and bill IT costs (labor, assets, license, infrastructure, expenses). Furthermore, allocated costs were provided with budget variance and revised forecasts each fiscal month.

A major component of the tracking effort involved implementing an IT Business Performance Management (IT BPM) solution, which integrated Project Portfolio Management (PPM), IT Services Management (ITSM), and IT Financial Management (ITFM) capabilities. Specific solution capabilities included tracking capital and operating project expenses, asset management, system configuration management, project management, help desk management, resource management, budgeting, forecasting, and allocations.

The initiative delivered more accurate budgeting and cost allocation to business units; improved tracking of IT inventory; the ability to implement IT service level agreements; the strategic realignment of IT resources; and decommissioning of costly systems. By implementing systems and processes that allowed IT to manage costs at a granular level, the company was able to reduce its IT budget up to 20% annually over the past eight years.





## My take

**Kevin Kessinger**

Executive Vice President, CIO, and Head of Corporate Shared Services  
TD Bank Group

When explaining “running IT as a business,” I like to use the analogy that building and delivering code is like running a factory. People may have a hard time visualizing that because there aren’t any physical products like cars or televisions coming off the production line. But make no mistake – there is a production line. You can get lost in the techno-speak, but it’s pretty simple. We have product owners who want to modify or build new products. There is designing, planning, building, testing, and rolling out to production. Unlike some manufacturers, we don’t have the option of shutting down the production line to re-tool for a new product so we have to run the bank even as we apply changes.

Our organization has a federated IT model with Infrastructure and IT Operations in the center. Seven line-of-business CIOs build and deploy solutions in response to business requirements from product managers. Our manufacturing line is the flow from business requirements to application development to data center operations. Our goal is to improve the end-to-end view of that production line. From the gleam in your eye about feature and function to the time it’s delivered, we want better predictability, lowest appropriate cost, and highest appropriate quality. My view is that CIOs should adopt the principle, “If it’s IT, and it runs inside the company, we own it. No matter where it started or how it was inherited.”

For 2012, we used “Run IT as a Business” as a theme. One of our first steps was to extend and enhance measurements and accountability. Across IT, we enhanced Monthly Operating Reviews with a defined structure to review all CIO accountabilities during the discussions. We more closely interlocked IT financials across the enterprise IT operating areas, and then extended the interlock to the lines of business. When we discuss financials, we have the total cost of ownership and matching numbers between areas, so we don’t begin with an exercise in rationalizing numbers. We’ve expanded this approach from financials to resources and headcount and further to our capital commitments. In the coming year, we plan to develop more sophisticated demand management as a broad tool progressing from basic reporting to proactive management capabilities.

I like the phrase “ERP for IT.” Even though IT is not yet at that level of maturity, it helps frame the next phases for us. As we expand the processes and tools for running IT as a business, integration of both process and data will progress the conversations even further from data reconciliation to focus on the substantial issues of platforms, priority, and timing. The plan is to manage to a comprehensive view of technology at TD.

I’ve been called a “blue collar technologist” because my interest in IT lies in capabilities that enable customer interaction, increase customer satisfaction, drive revenue, or reduce risk. To me that’s what it means to run IT as a business.

### Flying car future

Over time, true “ERP for IT” may move from marketing slides to software reality. BMC, CA, HP, IBM, and many other software providers are building, buying, and sometimes relabeling their solutions for CIOs seeking to automate their own domains. At some point a truly integrated suite solution may emerge, running the IT shop like today’s ERP systems run supply chain and financials.

Just as likely, a set of standards may evolve to allow consistent definition and handling of the lifecycle of business process management in the world of IT. Much like web services standards such as WSDL, XSD, and XSLT enabled self-describing data and interface objects, a layer of management and implementation standards could solve for today’s closed, proprietary handling of APIs and maintenance tasks across the technology landscape.

If discovering, invoking, and measuring IT services at the infrastructure, platform, data, application, or business service layers had common handling, the backbone of the business of IT could be reimagined as an open utilities layer. The majority of effort could be put on analyzing and managing actual business outcomes, instead of struggling to make disparate IT assets open, visible, and manageable.

Either way, the flying car future of IT is likely moving toward real-time understanding of the health, capacity, performance, and lifetime value of each asset – be it hardware, software, human capital, or third-party services. Where individual assets are governed by open market principles, with “plug and play” potential to migrate any part of the broad business process. Where IT resources can respond to business needs, drive operational efficiencies, or both. The CIO assumes a role as a portfolio manager – which encompasses risk management, financial management, and business stewardship.

The business of IT *is* the business of the business. Just as the CFO is responsible for the enterprise asset of the cash position, the CIO should be managing the enterprise assets of information and technology – even as their direct control and ownership of that information is changing over time. CIOs without a method for capturing, reporting, and managing the business of IT may be blind at the wheel – relegated to Chief Data Center Officer to care and feed those physical IT assets and resources that remain on the balance sheet.



### Where do you start?

Many IT organizations have done small amounts of business process reengineering and have some supporting automation in place, likely relying on fragmented, one-off, point solutions. The vision of a fully automated, integrated solution stack can seem daunting. But just as BPR, Y2K, and SOX fueled a boom of ERP and line-of-business process standardization, there is a “burning platform” in the world of IT – the surge of technology spend to capitalize on the convergence of postdigital forces of mobile, social, cloud, analytics, and cyber intelligence.

The business of IT should have an overhaul to address cost and efficiency sensitivities driven by changing macroeconomic conditions. This is important in order for IT to remain relevant in the new world of technology innovation. First steps should include:

- **Services mindset.** IT’s first concern should address taxonomy and ontology – being able to define what it does, and why it’s important. Expressing the business of IT in a common language with tangible, measurable, and attributable value is a required condition for higher-order finance management, portfolio management, and process efficiency improvements. ITIL and CMMI compliance are likely less important than well-defined, discrete descriptions of how to interact with IT services, and what to expect as a result.
- **Do it like you did with the finance or manufacturing function.** Once a common vernacular is in place, take a pulse on how well the various piece parts are working today. A quick maturity assessment can shine a bright light on opportunities. Areas that are manually driven or based on aging, fragmented technologies may not be the primary pain points. Priorities are more likely to be defined by the split of IT spend between discretionary investments and “keep the lights on” activity, as well as the disposition of IT projects and assets across the organization.
- **Slow and steady.** Few organizations will have the luxury – or the appetite – for a big bang overhaul of their IT function. Instead, take a roadmap view with an iterative approach to improving individual business processes and their supporting technology to yield significant gains. Integrate, over time, the individual processes and data to drive broader effectiveness and efficiency.
- **Outside-in.** Recognize that tomorrow’s technology footprint will likely be even more complex than today’s – with less direct control over assets (increasing dependency on external and, likely, cloud-based services), more ambiguity around boundaries of data and offerings, and a desire to dynamically realign and recompose a broad set of business processes based on market conditions and research-based innovation. The net effect: disciplines like contract management, vendor management, release management, and OSS/BSS of technical services will likely become critical (e.g., order management, provisioning, metering, billing, mediation). These may not even be a part of today’s IT charter, but will likely be the nexus of competition in the new normal.





## Bottom line

The Postdigital era should be great news for IT – a chance to expand their scope of services, and reinvent their brand as the business looks to technology to play a more strategic role. But fragmented IT processes and systems of the 1980s won't allow IT organizations to effectively deliver on the changing demands of the business. IT should change its management disciplines to keep up with the pace of change and stay relevant against growing options for external fulfillment of technology services.

## Authors

### Bryan Funkhouser

Principal, Deloitte Consulting LLP

[bfunkhouser@deloitte.com](mailto:bfunkhouser@deloitte.com)

Bryan Funkhouser currently leads the Project & Portfolio Management offering within Deloitte's Technology practice, and is also a national leader for the Client Excellence program, which sets the strategy and professional development standards for the organization's client leadership roles.



### Peter Vanderslice

Principal, Deloitte Consulting LLP

[panderslice@deloitte.com](mailto:panderslice@deloitte.com)

Peter Vanderslice currently leads the CIO program for Deloitte. He has over 25 years of experience in high technology and strategic IT management consulting, including the alignment of business and IT strategy and the structuring of large-scale IT transformation programs.



## Endnote

<sup>1</sup> Eric Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses* (United States: Crown Publishing, 2011).

# Conclusion

Faithful readers of our Tech Trends reports will find some familiar topics in these pages. The postdigital forces have seen extraordinary attention in the past four years – and each is still in the early stages of adoption. The book on how each can fundamentally reshape business is still being written.

Although the topics are familiar, the underlying trends continue to evolve at an astounding pace. Take mobile, for example. In 2010 the story was about ubiquitous connectivity and device (i.e., smartphone) advances. In 2011, the focus was on the “app” – and the advent of the tablet. In 2012, we covered enterprise implications for prioritization of opportunities, as well as the operational realities of governing, managing, and delivering mobile solutions. And now in 2013, we consider mobile’s place as an utmost strategic priority. The very notion of “devices” is exploding into near-ubiquitous connectivity of many physical objects. The fundamental element of mobile still applies – the innovative idea of removing limitations based on physical location, and of a truly untethered enterprise. But the supporting nuance and details are moving at a rapid clip, making it paramount for IT executives to keep pace with change.

Postdigital’s potential can spur both offensive and defensive responses. On one side lies opportunity for innovation. On the other, the existential threat of disruption. Every industry may be affected by the underlying digital forces. Every market may be reshaped by their controlled collision.

Who will lead the charge? The reports of IT’s demise may be exaggerated, but there is often truth behind the rhetoric. How will CIOs reimagine their roles in business strategy? What will the corresponding IT department look like? One thing is for certain: the elements of postdigital will play a foundational role.

We close this year’s report with the familiar quote from futurist William Gibson: “The future is already here...it is just not evenly distributed.” Our hope is that the Tech Trends reports will help you discover the elements of postdigital in your enterprise.

# Contributors

Jeff Anderson, Rajeswari Chandrasekaran, Ian Clasbey, Greg Comline, Teresa Dannemiller, Alex Dea, Lee Dittmar, Rafe Dyer, Chris Garibaldi, Michelle Hernandez, Jon Hoehler, Dan Housman, Paul Krein, Kristi Lamar, Nicole Leung, Andrew Luedke, Chris Martin, Taimur Mohammad, Blair Nicodemus, Izzy Park, Aaron Patton, Aaron Reabow, Farhan Saeed, Gordon Sandford, Terry Stuart, Tammy Swartz, Vikash Tiwari, Emad Toukan

## Research

**Leads:** Chris Chang, Justin Franks, Tom Gleason, Nick Johnson, Abhishek Mishra, Jose Munoz, Paridhi Nadarajan, Sam Soneja, Jeremy Young

**Team Members:** Jacob Artz, Felix Chang, Jenna Chen, Josiah Davis, Philip Davis, Kevin Downs, Jeff Eiden, Jason Febery, Andrew Fisher, Ramya Ganeshan, Dwij Garg, Leksi Gawor, Anil Gopala, Taylor Hedberg, Sam Jamison, Corey Ke, Kanisha Khaitan, Rebecca Kim, Adrian Kosciak, Karthik Kumar, Joy Li, Ryan Malone, Simy Matharu, Estefi Medina, Sean Mullins, Holly Musemeche, Abhishek Narula, Audrey Nguyen, Dan Nieves, Chinyelu Offodile, Akshai Prakash, Nathan Rabold, Adam Re, Talal Rojas, Brad Shivley, Dilys Sun, Yair Ton, Jenny Zheng.

## Special Thanks

Heidi Boyer, Cyndi Switzer, and Stuart Fano – the veteran heart and soul of our Technology Trends team. You continue to amaze with boundless energy, selfless team spirit, and pushing us to constantly raise the bar (and hit deadlines). Mariahna Moore, Jill Gramolini, and Kelly Ganis – for making a huge impact in your first year Tech Trending. This year's report would not have been possible without your drive, enthusiasm, and willingness to take on (and deliver) meaty content.



[www.deloitte.com/us/techtrends2013](http://www.deloitte.com/us/techtrends2013)

Scan the QR code to download the report or access additional on-line content.



**Recycled**  
Supporting responsible  
use of forest resources

Cert no. SW-COC-1689  
[www.fsc.org](http://www.fsc.org)  
© 1996 Forest Stewardship Council

This publication contains general information only and is based on the experiences and research of Deloitte practitioners. Deloitte is not, by means of this publication, rendering business, financial, investment, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional advisor. Deloitte, its affiliates, and related entities shall not be responsible for any loss sustained by any person who relies on this publication.

As used in this document, "Deloitte" means Deloitte & Touche LLP and Deloitte Consulting LLP, which are separate subsidiaries of Deloitte LLP. Please see [www.deloitte.com/us/about](http://www.deloitte.com/us/about) for a detailed description of the legal structure of Deloitte LLP and its subsidiaries. Certain services may not be available to attest clients under the rules and regulations of public accounting.

Copyright © 2013 Deloitte Development LLC. All rights reserved.  
Member of Deloitte Touche Tohmatsu Limited