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Seven Indisputable Technology Trends That Will Define 2015

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Abstract:

There are at least seven trends that will define the way we acquire, deploy, and support Information Technology (IT) over the next five to seven years. The trends are prescriptive and include the following: (1) Rent—Don't Ever Buy—Software; (2) Segment Users/Deploy Devices—and Align Devices, People, and Tasks; (3) Invest in Analytics—Finally and Heavily; (4) Respect Social Media—or Fail at Customer Service, Product Development, and Threat Assessment; (5) Innovate—or Close the Doors; (6) Go to the Cloud—and Align Your Core Competencies; and (7) Federate—Put Technology (and Other Functions) Where IT Belongs. The article addresses each of the trends and discusses the implications the trends will have on technology management, organization, investing, and optimization.

Keywords: IT planning; IT strategy; IT innovation; information systems development and acquisition, support; outsourcing; mobile systems; collaboration; automation; strategic planning; IT infrastructure; IT operations

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I. INTRODUCTION

It's hard to imagine anyone handing out heavy Wintel monsters to employees in 2015. Devices will get smaller, faster, and smarter—finally killing off the "fat clients" of the 1980s, 1990s, and early 2000s. Wikis, blogs, mashups, social networks, RSS filters, crowdsourcing, virtual worlds, automated pricing, and intelligent supply chains will define the future. Many companies—even the largest ones—will move toward open source software solutions. Business intelligence (BI) is a strategic investment everyone will make. The era of fixed-location computing is over, and just about everyone is already renting software over the Web. Ultimately, we'll all move to the cloud.[1]

How will these—and related—trends define our technology future?

There are major technology trends that deserve our attention, research and responses:

- Rent—Don't Ever Buy—Software
- Segment Users/Deploy Devices—and Align Devices, People, and Tasks
- Invest in Analytics—Finally and Heavily
- Respect Social Media—or Fail at Customer Service, Product Development, and Threat Assessment
- Innovate—or Close the Doors
- Go to the Cloud—and Align Your Core Competencies
- Federate—Put Technology (and Other Functions) Where IT Belongs

The insights here were gathered from surveys that were conducted over a relatively long period of time—2002 to 2010—through the Cutter Consortium (www.cutter.com) and from interviews conducted with CIOs and CTOs who are part of the Villanova University CIO Advisory Council (a group of twenty-five local and regional technology executives that supports the university's technology mission). The interviews were also conducted over a relatively long period of time—2005 to 2010. The surveys and interviews involved over 300 technology managers and executives. The data was collected through online surveys (administered by the Cutter Consortium) and face-to-face interviews conducted by the author. Survey instruments were developed for both data collection processes. General technology adoption questions were asked, as were some very specific questions about Web 2.0 and 3.0 technology (especially social media), boards of directors and IT, open source software adoption, organizational structures, innovation and technology investment trends. The data provides a sweeping perspective on technology acquisition, deployment, and support.

So what have we learned? What should we do? What do we still need to know?

II. RENT—DON'T EVER BUY—SOFTWARE

One thing is for sure: the hammerlock that the big proprietary software vendors have had on the market—even over the big enterprises—is over. Their biggest customers are always looking for ways to deliver the same functionality for much less money (and better service). Our research with CIOs clearly demonstrates that the vast majority of technology buyers believe that software costs way too much.[2] The big software vendors must change their pricing models, open their architectures, and learn to love hosting—by themselves and third-party partners—if they want to

[1] See Vaquero, Luis M. et al. "A Break in the Clouds: Towards a Cloud Definition." *ACM SIGCOMM Computer Communication Review* (39)1, Jan. 2009; "Cloud Computing," Horrigan, J. "Use of Cloud Computing Applications and Services," Pew Internet and American Life Project (12), Sept. 2008; Murugesan, S., "Cloud Computing: A New Paradigm in IT," Cutter Business Intelligence *Executive Report* (9)2, 2009; Orr, K., and A. Maher, "Here Comes Cloud Computing," Cutter Consortium Business Technology Trends & Impacts *Council Opinion* (10)1, 2009.

[2] The CIO Advisory Council of Villanova University's School of Business (VSB) comprised of local and regional CIOs and CTOs all report that enterprise software licenses are way too expensive. Much more significantly, all of them report that they are constantly looking for ways to reduce software costs. This, of course, means that proprietary software vendors like Microsoft, Oracle, IBM, Adobe, and CA need to worry about alternative—and cheaper—software delivery models. The large enterprise software vendors have no choice but to offer alternative software delivery models, especially pay-by-the-drink models. Other Cutter Consortium (www.cutter.com) research echoes similar sentiments.

grow. The days of 60 to 70 percent profit margins are gone. The days of controlling customers with hardware architectures, service packs, and poor integration and interoperability are also gone. The number of alternative software applications and the ability to deliver applications cost-effectively through nontraditional channels has fundamentally changed the game. In fact, it's only a matter of time before the major enterprise software vendors cannibalize their own software delivery models to protect their market share.[3]

Another major change will be active versus passive software design. Passive design is what software engineers have practiced for decades: someone identifies "requirements," and then some others code functionality into inflexible software applications. Everything's fine until a new requirement emerges and changes must be made. SAP (and others) has perfected the "do-IT-my-way" approach to software design: they—as many others—have embedded rigid processes into their applications and declared that the really "smart" users of their software will learn to adapt to the embedded processes versus customizing their near-perfect applications. Company after company deployed SAP (and other ERP) software and then wrestled with the process changes necessary to optimize the use of the applications. Enhanced functionality comes in the form of releases where the proprietary vendor decides which new features will be released and when they will be released and supported by the supreme creator of the software. In many respects, the embedded rigidity of twentieth-century proprietary enterprise software applications represents the way we acquired, deployed, and supported technology way back in the day.

Instead of rigid embedded processes, active software architectures enable the addition or subtraction of functionality through component architectures and application programming interfaces (APIs) that will grow increasingly flexible and available from a variety of sources, including the original authors of the software and all kinds of software mercenaries. Open source APIs will make it possible to reengineer functional designs in near-real-time. Even today we have enough APIs to make business analysts and requirements managers salivate, and every month more are published. Software will be designed in interoperable pieces, not monolithic structures. APIs and other components will enable functional interoperability, extensibility, and adaptability.

All of this enables a new software artifact: the (instant) mashup. Mashups represent the new prototypes, and the new mashup development environments represent what we used to describe as rapid application development (RAD) integrated development environments (IDEs). Mashups are the poor—or impatient—man's—applications. While today's mashups are toys, tomorrow's will be sturdy, interoperable, and extensible.

What about open source software (OSS)? The adoption of OSS will rise. But the real impact will be in the larger open architectures that OSS encourages. More and more pieces of proprietary software will be built around open standards. The whole service-oriented architecture (SOA) trend relies upon open, reusable and catalogue-able components. For software to truly become a service, it has to open up—and be inventoried. Everyone needs to know where it is, what it does, what it costs, and what impact it's likely to have on major and minor business processes. Published meta-data about software functionality, applications, and (reusable) components will enable the optimal selection and use of software solutions.

Beyond open architecture are the specific OSS applications that are challenging their proprietary twins. Osalt.com lists the major proprietary software along with its open source alternatives (http://www.osalt.com). It's amazing how many open source applications have impressed even the most conservative IT buyers over the past five years. OSS is creeping into every layer of the software stack; it's also appearing under it's own labels: where no one sees Apace, everyone sees what's happening with Google apps, Google docs, OpenOffice, MySQL, and SugarCRM, among countless others.

"Programming," as we've known it for decades, will morph into a variety of skills and competencies (much, probably, to the chagrin of the software engineering community). There will be a set of professionals highly skilled in architecture, application programming interfaces (APIs), and mashup technology that may well become the requirements-fulfilling front line of transaction processing. Perhaps the best indication of how successful this new set of professionals becomes will be measured in the go-to behavior of their business partners: if the business tilts toward them to satisfy requirements—instead of the traditional systems development lifecycle (SDLC) crowd—then "programming" will have morphed to problem-solving.

[3] They will persist with the current enterprise licensing models for as long as they can. When the well runs dry, they'll move quickly to not only offer new pricing alternatives but claim that they supported alternative pricing all along. Cynical? Not really. Proprietary software vendors have charged as much as they can for their products and services for decades. Why would they seek ways to charge their customers less? The answer lies in urgency and alternatives: they will adjust their pricing only when they have to; they will offer alternatives when the competition puts a gun to their heads.

It's impossible to discuss where software will come from without examining "app stores," principally from Apple, Google, and Research in Motion (RIM). The number of applications appearing monthly is staggering. But more significantly app stores represent a whole new software distribution channel. Even more stunning are the prices of the software at these stores. Countless robust business applications sell for way under $50. Some cost less than $10. Expense reporting? Time management? Basic accounting? It's all there. What this means for all of us is a whole new way to define software applications, whole new ways to acquire them, and unheard of price points—especially given what corporate software buyers are used to paying. Will Microsoft open an app store? How about Oracle or IBM? Of course they will. They all will.

Finally—and I'll discuss this in more detail later—there's the location of the software we actually use to enable communication, analysis, and transaction processing. Does it sit on your—or your provider's—server? Does it matter? The movement of data center responsibility from internally-serviced centers to centers in the cloud describes the journey that software has taken over the decades—not to mention the journey that pricing has taken over the same period. We'll see more pay-by-the-drink pricing models, even if the drink takes only a few minutes—or seconds.

So where will software applications come from? Just about everywhere. Software design and development will be shared and distributed among software engineers and business analysts using tools and techniques that the industry will provide as part of the ongoing march toward openness and interoperability. The whole notion of releases, upgrades, service packs, and version control will no longer dominate software availability. Waiting for tomorrow's software release to solve today's business problems will occur infrequently as functional alternatives grow in number and capacity. Why wait when you can build a mashup?

The big questions—that the tracking suggested below would answer—should focus on what future systems development lifecycles (SDLCs) will look like; what software procurement best practices will evolve to; what software acquisition, deployment, and support performance metrics will emerge; and what "software development" will actually mean.

Here's what we should do:

- Track app store download trends and measure the impact of cheap apps across a set of business value-derived performance metrics.
- Track mashup/API releases and measure the impact of mashups across performance metrics and negative metrics, like enterprise software licensing and third-party application development trends.
- Track open source adoption trends across small, medium, and large businesses, especially with reference to how OSS is replacing proprietary software.
- Track the adoption of the software-as-a-service (SaaS) and measure the impact on speed, agility, and cost of all of the on-demand/pay-by-the-drink software delivery models.
- Track the location of software applications: how many reside on desktops, laptops, tablets, smartphones, in the cloud? What are the trends?

Anyone interested in tackling this research? Is this the right agenda?

III. SEGMENT USERS/DEPLOY DEVICES—AND ALIGN DEVICES, PEOPLE AND TASKS

The adoption of Web-enabled smart phones is outpacing just about every technology in history.[4] As form factors have improved, so has functionality. Lots of assumptions have been challenged along the way. For example, how many of us believed that anyone would watch videos on a one-inch by one-inch screen? As it turns out, lots of Gen Xers and Ys are quite comfortable watching short—and long—videos on tiny screens. Many of the digerati also believed that soft keyboards would never be accepted by hardcore text messagers. Wrong again. Device adoption is not driven by form factors or exotic functionality, but by connectivity and reliability around basic services. Put another way, the assumptions that the traditional human factors crowd have made over the years about usability, form factors, ease of use, and even aesthetics have not proved valid.

[4] MorganStanley reports that the adoption of mobile Internet technology has outpaced the adoption of all previous technologies in the history of new technology adoption and penetration. See Meeker, M., S. Devitt, and L. Wu, "Economy + Internet + Trends, Web 2.0 Summit," Oct. 20, 2009, San Francisco, CA.

In the 1980s and 1990s, we assumed that there should be one corporate machine—the "standard" blessed by the company's governance policy. We assumed this for several reasons. First, we correctly believed that buying and supporting one machine was cheaper than buying and supporting whatever people felt they needed to do their jobs. Second, the industry really didn't offer us much choice: while there were lots of different PC manufacturers in those days, there weren't too many alternative architectures to the venerable Wintel (Microsoft Windows operating systems + Intel chips) machine. Finally, even if the industry gave us a lot of different machines, they wouldn't have been able to communicate with each other. So we were pretty much stuck with the one machine/one employee/one company model. When interoperability standards emerged, everything changed, and when consumerization became a driver of technology adoption, things really changed—and quickly. Now we have all sorts of devices that interconnect. But more to the point, we have multiple devices that satisfy personal and professional computing and communications requirements for a growing percentage of people.

Access devices in 2015 will look, feel, and act differently from one another. Variation will be widely accepted—even encouraged—since the relationship between variation and support costs will diminish. The desirability of machine standardization will yield to the imperative of interoperability standardization. Requirements will be defined around roles and requirements—and the devices needed to satisfy those requirements. The distinction between consumer and corporate devices will blur. It just won't matter what devices we use to connect to the Web, our internal data bases and applications and anything else we need to access in our private or public clouds. Synchronization among devices will be automatic and continuous. Devices will be customizable.

Companies are unlikely to buy PCs or other devices for their employees. Bring-your-device-to-work-and-we'll-connect-it is the new mantra in 2015. Between 2010 and 2015 companies will wean their employees off of their hardware budgets and either provide them an annual credit for their work device or just remove the "benefit" altogether.

There's no question that almost of us will access Web content and transaction capabilities via a very thin, throw-away client. We should focus much more on the virtual server than on the device used to access it. In fact, given communications technologies and trends, it makes sense to invest in the "host" much more than the "client." (There's also the digital divide issue: the cheaper the access device, the more people can participate in the ongoing digital revolution.)

First and foremost, network access in 2015 will be ubiquitous: we'll use desktops, laptops, tables, smartphones, other thin clients, and a host of multifunctional converged devices to access local area networks, wide area networks, virtual private networks, the Internet, hosted applications on these networks, as well as applications that run locally on (some of) the devices. The networks work pretty well today; tomorrow they will be bulletproof.

When the cost goes below $100, companies will provide thin clients to their employees. "Support" equals a basket in the corner of the room. But if thin clients are not deployed, then all bets are off: some companies will provide PCs, some will not, and some will offer an annual credit. But the economics are so compelling for either thin clients or small annual credits, we can expect the "fat" corporate PC to go the way of employee-covered health insurance: by 2015 less than half of the largest enterprises will still be providing free-computers-with-support to their employees. The other half will have moved to providing low-cost thin clients (smartphone, tablets, etc.) or offer a technology credit.

The big question here is about the form, ownership, and support of the devices we'll use to connect to the Web. They will be thin and cheap (we know that), but what about the structure of the device world? Here are some questions:

- What does segmentation look like? Who are the "users" and what do they do? Once we know who and what we can determine what device they need ….
- Will thin clients (tablets, smartphones, hybrids, etc.) replace desktops, laptops, and other "heavy" devices?
- What will the predominant "thin" architectures look like?
- What do the technology roadmaps of the device providers look like? Will they provide fully customized access devices?

What do you think?

IV. INVEST IN ANALYTICS—FINALLY AND HEAVILY

Data will always be king. But the king has an enormous—and still growing—court. Data is no longer owned by the enterprise. It's created by everyone: vendors, customers, suppliers, partners, managers, executives, strangers, bloggers, and vagabonds, and anyone else that would like to offer insights, solve problems, or buy things. Data is both proprietary and open in 2015. Business "intelligence" (BI) is about insight, interpretation, forecasting, planning, and adaptation. It's not about data warehousing or master data management, as important as these activities are as enablers of BI and larger business analytics.

"Data" includes information, knowledge, and content—and it's fully dynamic in 2015. It lies at the heart of the new business models: without data it's impossible to customize, personalize, up-sell, cross-sell, automate, or gather business intelligence in real-time. But in order to achieve these capabilities, structured and unstructured data, information, content, and knowledge all need to integrate.

The push for real-time analytics will drive many data architecture and business intelligence (BI) investments. Real-time (RT) is a requirement that will be satisfied by 2015 technology architectures and platforms. RT dovetails with mobility, with thin clients, mashups, Web 2.0/.30, social media, and all of the macro trends that meet in 2015.

The torrent of social media data will overwhelm data bases. Open source platforms like Apache's Cassandra and Hadoop have been designed for large scale transaction processing of structured and unstructured data. Others are working on social media plug-ins to enterprise CRM and ERP platforms. You get the idea: we're gearing up for collecting and processing massive amounts of unstructured social media data, which will eventually lead to real-time transaction processing of all kinds.

Here are the research questions:

- Will the new BI/analytics technology architecture assume the integration of structured and unstructured data?
- Will next generation BI/analytics functional architectures embed real-time analysis of structured and unstructured data?
- How will data storage architectures accommodate the structured/unstructured data firehouse?
- How will "data base management" be defined in 2015? How will traditional relational and object-oriented tools morph to automated collection, analysis, and reporting environments?
- What are the components of the technology roadmaps of the major BI vendors that speak directly to the new predictive agenda? How are the roadmaps being operationalized?

V. RESPECT SOCIAL MEDIA—OR FAIL AT CUSTOMER SERVICE, PRODUCT DEVELOPMENT AND THREAT ASSESSMENT

Social media is on fire. Web 3.0 is the next tsunami.

Wikis, blogs, RSS filters, mashups, crowdsourcing, podcasts, and content tagging/sharing all scream collaboration. Just a couple of years ago, companies were deciding how they were going to ban social networks and larger forms of social media. Now the same companies are learning to embrace social networks and social media. What's changed? Everything—and it's permanent.

Social media tools and techniques are extended by location-aware applications. For example, sales and marketing has enormous location opportunities. Knowing where customers are enables real-time personalized marketing: when a restaurateur knows that a customer is fifty yards away from his/her establishment, he/she can offer a deal to get that person to have breakfast, lunch, or dinner at 20 percent off regular price. And why not? Similarly, location-awareness enables companies to track shopping habits, travel, and delivery routes, among countless other activities.

Social media assumes that there's value in connecting people willing to collaborate through their affinity with people, places, products, and brands. Did anyone really think that Twitter would attract as many people as it has? Customer service and new product releases are especially vulnerable to twittering. Companies now need to worry about what's being said about them in social media. There are now several companies that help their clients "listen" to what customers, partners and employees are saying about them in Facebook, Twitter, MySpace, TripAdvisor, Yammer and countless other social media. Some of these companies listen but others, like ListenLogic (www.listenlogic

.com), extract meaning and purpose from social content—which is what companies really want. Put another way, companies need to not only know *what* people are saying about them, but *why* they're saying what they're saying—*and the response implications of the conversations on products, services, and strategies.*

Web 3.0 represents another technological sea change. Wikipedia defines Web 3.0 as the:

> *… evolving development of the World Wide Web in which the meaning (semantics) of information and services on the Web is defined, making it possible for the Web to understand and satisfy the requests of people and machines to use the Web content. It derives from World Wide Web Consortium director Sir Tim Berners-Lee's vision of the Web as a universal medium for data, information, and knowledge exchange.*

Just as data is king for Web 1.0 and 2.0, context is king for Web 3.0. Smart search, deep problem-solving, intelligent deduction, and other activities will be enabled by Web 3.0 technologies. In fact, when full context surrounds search, transaction processing, and problem-solving, it will fuel proactive behavior and huge amounts of automation—the real Holy Grail of the Web platform. Web 3.0 will evolve toward wider and deeper context, and the Web will continue to grow from repository to enabler. By 2015, much of this context will exist, but there will still be lots to do. There's no question, however, that the ultimate capabilities of the Web will have been outlined and partially experienced by 2015. (By 2025, this whole discussion will seem silly.)

The major research question is about embedded understanding, intelligence, and automation. We need a compass here to keep us on track toward automated, intelligent supply chains, innovation, and sales, among other functions. Will it work? What will it cost?

Let's propose a research agenda:

- Will social media achieve equal status with structured customer, brand, and related data?
- Will real-time become a mandatory corporate requirement?
- Will Web 3.0 arrive on schedule—in 2015—or will it be delayed due to chronic deficiencies in artificial intelligence (AI)?

How automated will all this become?

VI. INNOVATE— OR CLOSE THE DOORS

Innovation is everyone's job. Regardless of where anyone sits in an organization, innovation is essential to survival and, therefore, a core competency of every competitive organization on the planet. But how will twenty-first century companies innovate?

As a permanent core competency, innovation will be aggressively funded. However, significant amounts of funding will not go to internal research and development (R&D) teams, but to teams distributed across the globe through next-generation crowdsourcing. Once the intellectual property (IP) lawyers figure out what to do with advanced crowdsourcing, even conservative companies will rethink their innovation strategies to include crowdsourcing and other Web 2.0/Web 3.0/enterprise 3.0 innovation strategies. Internal crowdsourcing, private cloud crowdsourcing, and open public crowdsourcing will all be viable crowdsourcing options.

Beyond crowdsourcing, by 2015 companies will have multidimensional innovation strategies. They will build open innovation networks consisting of investments, partnerships, incubation, licensing, business process management (BPM), and incentives. Savvy companies will actively pursue seed and early stage investments in companies that can provide innovative solutions. Mergers and acquisitions (M&A) are another piece of the innovation strategy, as are investments in incubators that are ideally located away from corporate headquarters. Licensing is yet another part of the strategy, as are investments in BPM, since the reengineering and automation of key business processes is a key innovation methodology. Finally, smart companies understand the power of positive incentives that should be spread throughout—and beyond—the organization.

BPM will become institutionalized, and software-based collaborative technologies will be merged with hardware-based technologies, especially two-way active RFID, adaptive displays, speech recognition, biometric payment systems, and intelligent sensor networks. Sensor technology will emerge as a platform unto itself that enables countless analyses, inferences, and real-time transaction processing. Sensor networks will collect, interpret, and communicate and amplify the capabilities of Web 2.0 and 3.0 technologies—and real-time automaton is the end-state.

The new technology roadmap needs depth:

- What are the major software-based innovative initiatives that will drive real-time, automated processing?
- Which hardware-based technologies will augment and amplify which innovative software technologies?
- What forms will "open innovation" actually take? How will its effectiveness be measured?

These are huge questions that need specific answers.

VII. GO TO THE CLOUD AND ALIGN YOUR CORE COMPETENCIES

When did information technology become a competency? Furniture is not a competency. Communications is not a competency. Travel is not a competency. Why is IT a core competency? For some—very few—companies, IT is—and should remain—a core competency, but for many others, IT's way outside the scope of what companies need to survive and prosper.

Once insightful, candid companies end the core competency dance, they will avail themselves of the acquisition/deployment/support alternatives the industry has provided. The path is simple: infrastructure first, followed by applications, and ultimately "platforms." Services around these activities are wide and varied. The major technology vendors—like IBM, Oracle, and Microsoft—have embraced X-as-a-Service delivery models, while other vendors—like Salesforce.com—have been champions of alternative delivery models for some time. The credibility that large vendors bring to XaaS is huge—and validates the delivery models as "acceptable" and "safe" to large enterprises. Companies will assess the impact that cloud sourcing—including all of the alternative X-as-a-Service delivery models [SaaS (software), HaaS (hardware), IaaS (infrastructure), PaaS (platform), CaaS (communications), STaaS (storage), and BIasS (business intelligence)]—will have on their performance. They will assess the impact private clouds will have (while expressing concerns about public cloud security). Cloud architectures will be developed that determine which services are best moved to the cloud, which should stay standardized within corporate firewalls, and what a cloud migration strategy should look like.

Where do you stand? Here are the research questions:

- What is the rate of adoption of cloud delivery today—and going forward?
- What are the obstacles to cloud adoption, rank-ordered by concern, cost, and impact?
- When will internal and external auditors embrace the cloud with a set of standards that work for multiple industries, especially highly regulated industries that require validated technology?

VIII. FEDERATE—PUT TECHNOLOGY (AND OTHER FUNCTIONS) WHERE IT BELONGS

Organizations in 2015 will be loose and fluid, not inflexible. The ultimate requirements will be agility fueled by globalization. The notions of "control" and "ownership" will change fundamentally. The struggle for control and ownership will flip and flatten the hierarchical models of the past. Operational technology will remain largely centralized by shared services organizations that rely on alternative delivery models to satisfy infrastructure requirements; *strategic technology will decentralize completely to the business.*

Operational technology will remain within the "control" of enterprise IT and its internal and external delivery partners. Note the reference to internal and external partners: it's inevitable that significant parts of the IT infrastructure—operational technology—will be outsourced via X-as-a-service delivery models supplemented by the deployment of open source software, thin client architectures, and, ultimately, cloud computing. The "rules" around infrastructure deployment and support will be written—and enforced—by corporate IT.

The rules around strategic technology acquisition, deployment, and support will be written by the business and edited-without-authority by corporate IT. This dramatic shift in governance reflects the changes in the velocity of business, the need for internal control of business processes, and technologies that enable the business—as both creators and end-users—to satisfy their own dynamic requirements.

The structure of the operational technology organization is conventional—and radical. The conventional pieces include infrastructure architecture, network design, implementation and support, storage management, back-up and recovery, security and risk management, applications support, device procurement and management (servers, PCs, laptops, tablets, smart phones, etc.), network and systems management, performance management, and infrastructure vendor management, among other operational technology tasks. The rise of vendor management is tied directly to the rise of outsourced services via the new technology delivery models (SaaS, HaaS, etc.). Reporting

relationships should reflect all of these responsibilities which are assumed to be integrated and coordinated. External advisory boards may be used to keep the organization well-informed about what's happening with competitors and the industry itself. Process officers should be added to the operational technology organization with the mission of assuring that the key functions of the organization are achieved. The processes should include security, performance measurement, compliance, and architecture.

The strategic technology organization is a very different artifact. This organization is about business requirements and the fulfillment of those requirements through the development and deployment of applications, investments in analytics (which assumes investments in data and information architecture, master data management, and data security, among other areas), the mapping of business processes, and a sustained focus on customers. The strategic processes include innovation, return-on-investment, and architecture—which provide the linkage to operational technology.

Operational technologists will report to Chief Operating Officers or their equivalent. They will not report to the CEO. They will not report to the CEO because operational technology is not strategic and because CEOs do not need to measure infrastructure performance: they need to expect IT to enable business processes that lead to cost control and revenue generation.

There will be a Chief Infrastructure Officer responsible for operational technology with deputies for the functional and process areas. The strategic technology organization will report directly to the CEO for some very obvious reasons, not the least of which is the company's strategic dependency on technology, the role that technology plays in corporate operations and the potential strategic contributions technology can make to the business. But, in addition to a bold line to the CEO, the strategic technology organization will have a bold line to the lines of business.

2015 will not define technology as silos organized around internal performance metrics. Instead, business technology convergence will integrate business and technology performance around simple metrics like saving money, making money, improving services, and compliance. The religious technology wars of the twentieth century —-when we fought about everything technical—and the ceasefire of the early twenty-first century will yield a permanent partnership between technology and business, a partnership that will have all but disappeared by 2015, reflecting the completion of the convergence mission.

Can you predict what the technology organizations of the future will look like?

Who will "win" and who will "lose"?

IX. SUMMARIZING IT

The technology and technology management trends of the past thirty years actually seeded the different flavors of technology management emerging now, changes that will persist for decades. In other words, we're about to reach a new steady state, a kind of business technology convergence that takes the business technology relationship to a new level. CIOs born before 1970 will become roadkill as the seamless trend unfolds.

By 2015, operational technology requirements have merged with business requirements and vice versa. There's less distinction now between business and technology then there has ever been. We've gone from business technology *alignment* to business technology *convergence* in just a few decades. Much of the heavy lifting that got us here was due to the efforts of hands-on, in-the-trenches CIOs who worked tirelessly—often in their own self-interest, but tirelessly, nonetheless—to raise the importance of technology at their companies. As it turns out, they may have been too successful: we now need their services—at least the services that made them famous—less now than we ever did. Conducting due diligence around the best infrastructure purchases isn't what it used to be. Spending months and months deciding which PCs to buy is no longer considered a good way to spend time. Most of the data center consolidation work has been completed. Thanks to Sarbanes–Oxley and other compliance formulae, we've largely solved the backup and recovery problem. E-mail? Word processing? Spreadsheets? These are all old problems, long since solved by dutiful CIOs and their minions.

There's less infrastructure work to do these days. The number of PC manufacturers has fallen to a handful. The decision space around requirements like security, backup, recovery, storage, and even eDiscovery has narrowed considerably over the past five years. Years ago, we would spend a year or two conducting criteria-based analyses of alternative hardware platforms. Today those decisions are made in thirty days or less. Not so many years ago, we used our own people to design, deploy, and support our computing and communications infrastructure. Today we look for smart partners to which we can off-load non-core technology requirements. Eventually everyone will end up in the cloud. Infrastructure will launch first, followed by applications, and eventually the entire computing and

communications platform. The CIOs who survive will be responsible for planning their missions to the cloud. Some of them will do this well and some very poorly: not that many CIOs are deeply skilled in both advanced vendor management and cloud computing—arguably the two most important skills of 2015.

Unfortunately, most companies are much better at operational technology than strategic technology. This needs to flip. Strategic technology should move to the business units responsible for profit and loss (P&L). The business managers responsible for strategic applications can source them the same way infrastructure managers will source their applications: from the cloud. The linkage between operational and strategic technology will occur at the architectural standards level. So long as the strategic applications are compliant with the overall enterprise/applications/communications/data architecture, they can be acquired and deployed by the lines of business. This means that requirements, business process modeling, re-engineering, and performance metrics all move to the business. This frees us from creating business relationship management offices, enterprise project management offices, and all of the activities we've supported over the decades to get technology closer to the business. Just put strategic technology in the business.

Another aspect of all this change is globalization—which will force convergence in several important ways. In fact, globalization is the glue that will strengthen convergence—and customization. Where we used to think about common global business processes and one-size-fits-all technology platforms to enable them (like single instance ERP systems), the future will look very different. While many processes will persist no matter where companies operate globally, many other processes will regionalize and localize. Hub-and-spoke application models will emerge as the flexible alternative to single instance ERP platforms. This means that functionality will simultaneously globalize, regionalize, and localize based on specific transaction processing requirements. Multinational corporations will abandon global standardization in favor of decentralized models that emphasize agility and flexibility. While everyone thinks about all the offices that will be opened as their companies expand, technologists need to also think about all of the offices that will close when things don't go so well. Hub-and-spoke, regional and local, and cloud-based technology delivery models will push global standardization right off the docket.

X. EPILOGUE

Is this the end of "IT"? Yes, IT's finally over. It's 2015 and everyone's a chief information officer, or, more accurately, everyone's a chief business intelligence officer (with advanced degrees in innovation and cloud computing). While your infrastructure hums in the cloud, all eyes are on strategic technology and the businesses now directly responsible—and accountable—for business technology optimization.

The business technology "alignment" journey will end in 2015. While it may not occur precisely on January 1, 2015 or even in 2016, it will happen. All of the stars are aligned to yield convergence. We struggled for decades to get business professionals to talk to technology professionals, to get requirements "right," to define workable governance and organizational structures, and craft budgets that made sense to competing professionals. We also fought a whole lot about unproductive things, like whether HP laptops were better than Dell laptops, if process engineering should precede technology investments, and if business analysts should sit alongside their business partners. Who should technology report to? First, it was the COO, then it was the CFO, then it was the CEO, and then back to the CFO, and then back to the COO. Governance, governance, and more (or less) governance. The last quarter of the entire twentieth century was devoted to finding the organizational needle in the haystack: the perfect governance structure—which gave us imperfect technology standardization and less-than-perfect—though often implemented—exception management worst practices.

Back in the day, many of the arguments persisted because we had nothing better to do, no viable alternatives to the way we acquired, deployed, or supported technology. But today—and definitely by 2015—we have alternatives. IT finally happened. Is IT OK, or will we long for the past when IT inevitably arrives?

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