MITSloan CIO SYMPOSIUM

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Center for Digital Business
SIM Boston

2011

8th Annual MIT CIO Symposium

EXECUTIVE SUMMARIES

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The MIT Sloan CIO Symposium

The MIT Sloan CIO Symposium is the premier global event for CIOs and senior IT executives to become better business leaders. CIOs and senior IT executives receive actionable information that enables them to meet the challenges of today's changing global economy. This annual event offers a day of interactive learning and thought-provoking discourse on the future of technology, best practices, and business

The MIT Sloan CIO Symposium is organized and developed by a team from the MIT Sloan Alumni Club of Boston, the MIT Center for Digital Business and the Boston Chapter of the Society for Information Management. To learn more about the 2011 MIT CIO Symposium, and to get information about the 2012 Symposium, visit www.mitcio.com for more information.

The Focus of the 2011 Symposium

The rapid changes in the digital business world necessitate that enterprises transform themselves in order to keep pace and to sustain their competitive advantage. The current environment offers both enormous challenges and opportunities. Topics like cloud computing, software-as-a-service, mobility, cyber-security, and analytics are foremost in the minds of CIOs. But more important than technology, CIOs are focused on making a difference in their organizations and to their businesses. Doing so is about leadership and management.

That's why the theme of the 2011 MIT CIO Symposium was so timely and relevant. The theme was: *Beyond the Crossroads–How will the CIO role evolve in the digital business world?* Based on that theme, the focus of the 2011 Symposium was helping CIOs catch the next wave and prepare to impact their organization's future. Sessions focused on the most important technologies of the future and the most important leadership skills that CIOs will need.

Executive Summaries by the International Institute for Analytics (IIA)

To enhance the value of the 2011 MIT CIO Symposium, executive summaries have been created that capture the key takeaways from each session. Feel free to distribute these broadly in your organization.

These executive summaries have been created in partnership with IIA (www.iianalytics.com). IIA is dedicated to the advancement of analytics in everyday business practices. Under the direction of Tom Davenport, IIA brings together the world's leading analytics practitioners and researchers to provide unique insights to both business and IT leaders on the most current research findings and industry best practices.

IIA publishes research, fields industry-focused Analytics Research Councils, performs benchmarking, and has frequent practitioner events where analytics best practices are shared. IIA is supported by the following underwriters: SAS (www.sas.com), Intel (www.intel.com), Teradata (www.teradata.com), Accenture (www.accenture.com), SAP (www.SAP.com), and Dell (www.dell.com).

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http://www.mitcio.com/speakers.php#

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Welcome Remarks

- Speakers: **Dr. Graham G. Rong**, Chair, MIT Sloan CIO Symposium & Director, MIT Sloan Alumni Club of Boston
  Professor David Schmittlein, John C. Head III Dean, MIT Sloan School of Management
  Karl F. Koster, Executive Director of Corporate Relations, MIT Industrial Liaison Program

Overview

The 2011 MIT Sloan CIO Symposium focused on the changing technological landscape, its impact on business, and the evolving role of the CIO. As has been the case for MIT's 150 years, this Symposium demonstrates how MIT is playing a key role in inventing the future, making a difference in the world, and changing how business leaders think and operate.

Context

Dr. Rong welcomed the Symposium's 750 participants from around the globe and noted that the MIT Sloan CIO Symposium has become one of the premier CIO conferences in the world. Dean Schmittlein described how this Symposium is consistent with MIT's longstanding mission and how MIT has been a leader in developing technology and using technology to change the business world. Karl Koster explained MIT's Industrial Liaison Program (ILP).

Unique to the 2011 MIT Sloan CIO Symposium was that it coincided with MIT's 150th anniversary and it marked the first year of partnering with the ILP.

Key Takeaways

- **The theme of this year's conference, "Beyond the Crossroad," reflects the landscape for CIOs.**

  With the emergence of the cloud, mobile devices, and social networking, the technology landscape and the entire business environment have undergone dramatic change. These changes are no longer a crossroads question; we have gone beyond the crossroads. Enterprises need to transform themselves to keep pace and to maintain their competitive advantage.

  > *"These new changes are beyond a crossroads question. Enterprises now need to transform themselves to maintain their competitive advantage."*
  > — Dr. Graham G. Rong

  This transformation will offer challenges and opportunities for enterprises and CIOs. It will require a significant evolution in the role of the CIO and the leadership that CIOs demonstrate. This conference examined this transformation and changing role.

- **This conference is consistent with MIT's mission of having impact and inventing the future.**

  When MIT was founded in 1861, the purpose wasn't just education or research; it was having impact on society, inventing the future, creating new and positive outcomes, and making a difference in the world. This holds true 150 years later. One of the ways that MIT fulfills this purpose is by convening important events, such as this CIO Symposium, to bring people together to invent the future.

  > *"MIT, for 150 years, and right now, is making a difference in the world."*
  > — David Schmittlein

- **MIT, and especially the Sloan School, has played a key role in changing how business is conducted.**

  It is certainly the case that MIT has led the world in developing breakthrough information technology systems that have changed the world. But in addition to developing new technologies, MIT, and particularly the Sloan School, have led with respect to how information systems have changed innovation, changed the competitive landscape, and changed the way that business leaders think and operate. MIT has also changed how business leaders see their responsibilities and those of the CIO.

  > *"If you look at the way that information systems are driving so many changes . . . it is the MIT Sloan School that has been in the center, in fact at the forefront of these changes."*
  > — David Schmittlein

- **MIT's Industrial Liaison Program (ILP) applies technological advances to industry.**

  There is tremendous innovation coming out of MIT. The role of the Industrial Liaison Program is to identify how these innovations can be applied to industry.

  > *"We in the Industrial Liaison Program are always asking, 'What is the potential application of these advances to industry?'"*
  > — Karl F. Koster

  Currently, over 800 companies work with faculty and students on projects, which translates into $111 million in industry-sponsored research. This is just part of the $627 million in corporate-sponsored research that MIT received, making MIT the largest recipient of corporate-sponsored research of any university in the world.

View from the Top: Opportunities and Strategies in the Digital Business World

- Moderator: **Gregory Huang**, Editor, Xconomy Boston & National IT Editor, Xconomy
- Panelists: **David J. Castellani**, Senior Managing Director & CEO, New York Life Retirement Plan Services
  Brian Halligan, CEO & Co-Founder, Hubspot
  Tianwen Liu, Founder, CEO & Chairman, iSoftStone
  Eric Openshaw, Vice Chairman, Global and U.S. Technology Leader, Deloitte LLP

Overview

The most effective CIOs analyze IT issues from a business perspective, striving to lower costs and eliminate outmoded software and hardware. They also use technology to transform how business is done. Cutting-edge systems can change the company culture and attract talented knowledge workers, while social media tools can increase a CEO's authenticity and transparency.

New technologies like social networking, analytics, mobile, and cloud computing have great potential for the business world. Savvy CIOs must be sensitive to institutional obstacles and technology gaps that can hinder implementation.

Context

The panelists discussed the evolving relationship between CIOs and CEOs, as well as best practices in today's digital business world.

Key Takeaways

- **CEOs value CIOs who use technology to transform all aspects of the business.**

  In today's rapidly changing world of technology, CIOs have a unique opportunity to lead their organizations to higher levels of profitability and employee satisfaction. This means taking a broad view of how technology can improve the bottom line, the company culture, and communication with external constituencies. The panelists identified four ways that CIOs can add value to organizations and work more effectively with the CEO.

  1. *Analyze IT issues from a business perspective*. The best CIOs view technology problems through a business lens. For example, reducing legacy systems is one way to free up capital and human resources. By helping the organization do more with less, CIOs elevate their status on the management team and at the board level.

     > *"To have a seat at the table, IT leaders need to free up capital and human resources. You also have to hire differently and think differently."*
     > — David J. Castellani

  2. *Promote innovation throughout the organization.* It is common for innovation to happen at the outer edges of a company. The marketing department, for instance, may use the Amazon platform to win sales in new ways. To partner with the business and accelerate its success, CIOs must get involved with innovation throughout the organization.
  3. *Change the company culture.* Most companies that were established before software applications and the Internet use military-based command and control hierarchies. But this way of doing business is no longer compatible with how employees work. The CIO must transform the culture through technology and pull it into the 21st century. This means making applications available on mobile devices and providing workplace applications that are as appealing as consumer apps. When Generation Y employees enter the workforce, they should feel that the environment makes sense and is how organizations should work.
  4. *Help the CEO transform the relationship between the corporation and the marketplace.* Traditionally, corporations have communicated through one-way press releases. This must be changed so everyone has access to an authentic and transparent CEO. Chief executives should be active on blogs, Twitter, and Facebook. The CIO must take the lead and guide the CEO through that process.

     > *"There is an opportunity for the CIO to help the CEO transform the relationship between the corporation and the marketplace and open things up."*
     > — Brian Halligan

- **The most attractive technologies are deflationary, destructive, and disruptive.**

  Technology provides value to an organization when it lowers costs, eliminates outmoded software and hardware, and transforms the way business is done. David Castellani described attractive technologies as deflationary, destructive, and disruptive.

  For CEOs, cost savings are compelling. New York Life Retirement Plan Services, for instance, believes it could reduce IT costs by 60–70% by replacing legacy systems with dumb terminals, iPads, and smart phones. This development would be both deflationary and destructive.

Brian Halligan said that Hubspot runs its business on salesforce.com and his top technology priority was to lower the application fees and to eliminate integration costs with NetSuite.

The panelists suggested that a disruptive use of technology is transforming data into business intelligence. When focused analysis is applied to large data sets, extraordinary intelligence is possible. Deloitte's data analytics group, for example, can predict bank failures within 60 days using publicly available data. Looking ahead, Eric Openshaw believes that great analytics opportunities exist for semi-structured and unstructured data.

- **New technologies will not succeed in the workplace until institutional issues and technical gaps are overcome.**

  The panelists offered predictions for the future of social media, analytics, cloud computing, and mobile in the business world. For these technologies to provide maximum benefit, institutional issues like employee education and CIO support must be addressed. In addition, new applications are needed to fill technical gaps.

  — *Social media.* Social networking has become central to personal and professional life, and has broken down the barriers between these two realms. Social media is too widespread to be barred from the workplace, and it also has far-reaching implications for employers.

  For professional services organizations with confidentiality issues, social networking is a top-of-mind issue. Deloitte is struggling to implement the right platforms internally and externally, as well as to educate employees. Confidential information can proliferate quickly with one wrong Tweet or Facebook post.

  New York Life Retirement Plan Services has connected clients using an in-house social networking system, similar to LinkedIn. Customers can post and answer questions related to best practices.

  > *"You can't stop people from using social media. But what you can do is educate, educate, educate on what is appropriate and what isn't so you can get mileage out of the tools."*
  > — Eric Openshaw

  — *Big data and analytics*. Although huge amounts of business data exist today, only employees with specialized skills can analyze them. Unfortunately, there are no business intelligence systems that allow regular employees to create accurate reports. Solutions are needed that decentralize report creation and reduce the need for an analytics group.

  — *Cloud computing and mobile*. Cloud computing is a good way to outsource non-core infrastructure, obtain lower computing costs, and implement innovative applications. CIOs, however, are often reluctant to implement cloud-based and mobile applications in the corporate infrastructure. This resistance must be overcome; consumer-oriented cloud and mobile applications are the norm and employees expect enterprise systems to work in the same ways.

  > *"From the front of mobility and cloud computing, I believe there is a tremendous opportunity over the next five years to totally change the technology world and the way we are doing business."*
  > — Tianwen Liu

- **CIOs must use new approaches to attract and retain knowledge workers.**

  Constant learning is essential to passionate knowledge workers. As a result, they view their tenure with organizations as learning opportunities rather than long-term employment. It is common for today's knowledge workers to change organizations frequently.

  In modern companies, knowledge workers are changing the organizational structure. Hierarchy has been replaced by ad hoc groups that assemble for projects and then dissolve. With knowledge workers, broader reporting structures are possible. At Google, for example, 60 employees report to one manager.

  CIOs must recognize these new realities and create talent-enabled ecosystems that attract passionate knowledge workers. Even if these individuals are independent contractors, they can bring tremendous value to a company.

Other Important Points

- **Proprietary applications.** David Castellani noted that cloud-based applications are preferable to proprietary software. In general, proprietary applications create problems rather than add business value.
- **Security and intellectual property.** Today, the lifespan of intellectual property is short. Keeping IP secret is no longer a good way to make money. It is preferable to be open with IP.
- **Machine-to-Machine technologies.** This type of technology is popular in China and could have a major worldwide impact.
- **Unstructured leadership.** For unstructured leadership to work, massive amounts of trust must exist between employees and the employer. Hubspot increases that trust through transparency and collaboration. A blog post by Brian Halligan on this topic can be found at http://onstartups.com/tabid/3339/bid/13420/Startup-Culture-Lessons-From-Mad-Men.aspx.

MIT's Perspective: What Every CIO Should Know About the Future Impact of Digital Business

- Moderator: **Jason Pontin**, Editor-in-Chief & Publisher, *MIT Technology Review*
- Panelists: **Prof. Erik Brynjolfsson**, Schussel Professor of Management & Director, MIT Center for Digital Business, MIT Sloan
  Dr. David Clark, Senior Research Scientist, MIT CSAIL
  Prof. Gregory J. McRae, Professor Emeritus, MIT & Executive Director, Morgan Stanley
  Prof. Alex (Sandy) Pentland, Professor, MIT Media Lab

Overview

The volume of digital data collected by American businesses today is greater than ever before. These enormous stores of detailed information represent a "nanodata revolution." It will be possible for CIOs to put this data to use by developing predictive models and leveraging analytics that transform how companies are run.

Although the opportunities are great, CIOs must also acknowledge the challenges that come with large volumes of unstructured customer data. From a technical perspective, computing architectures must be rethought and new analytical techniques are needed. Issues of security and privacy will raise public policy and regulatory questions.

Context

The panelists discussed the explosion of data and how CIOs can address the associated opportunities and challenges.

Key Takeaways

- **The nanodata revolution presents a unique opportunity for CIOs to transform business.**

  One of the biggest opportunities for CIOs is the nanodata revolution. In the span of two to three days, more digital data is collected by American businesses than has been collected in all of history up to the year 2003.

  The data consists of Internet clickstreams, Google searches, mobile data, and ERP data related to operations and customers. It is now possible to analyze companies using very fine-grained information.

  To drive effective data-driven decision making, CIOs must build teams that know enough about the business to formulate questions correctly, and are also skilled in conducting data-driven analyses. This is a fairly rare combination of competencies.

  A study by the Center for Digital Business found that companies using a data-driven approach to decisions are 4–6% more productive than competitors that rely on intuition and experience to make decisions. CIOs will be at the center of the nanodata revolution, enabling senior management to use data more effectively and to transform the way companies are run.

> *"In the next few years, we're going to see more and more firms taking advantage of this flood of data and CIOs will be at the center of that revolution."*
> — Erik Brynjolfsson

- **With large volumes of unstructured data, companies can build powerful predictive models.**

  Unstructured data, such as location data from cell phones, financial transactions, and information from security cameras and RFIDs, is one of the fastest-growing data categories. Large volumes of information about consumers' intentions can be matched with other types of data to quickly build predictive models.

  The panelists described several examples of how unstructured data is being used in innovative ways:

  — *Real estate forecasts.* The MIT Center for Digital Business matched Google search data with housing sales and outpredicted the National Association of Realtors' forecasts.

  — *Health predictions.* By analyzing mobility data from cell phones, it is possible to predict whether a person is likely to develop diabetes. Knowing who is at risk for diabetes can save insurers and healthcare companies billions of dollars.

  — *Productivity improvements.* A financial institution analyzed communication patterns at a call center. By examining electronic and face-to-face communications, they reorganized their break structure and improved productivity. This resulted in savings of $15 million per year.

  — *Consumer preferences.* By analyzing unstructured data, researchers can predict what apps consumers will download to their mobile device with high accuracy. Cross-selling opportunities have also been identified that were ten times better than standard methods.

> *"From my perspective, the most important growth is in unstructured data . . . when we look at it, we find things that are absolutely startling."*
> — Alex (Sandy) Pentland

- **CIOs cannot ignore the technical and security challenges associated with today's large volumes of data.**

  Although companies can benefit from using large volumes of data for decision making, the information explosion also presents CIOs with numerous challenges. Existing hardware infrastructures and analytical techniques are not well suited to unstructured data. In addition, maintaining and analyzing new forms of customer data introduce security and privacy concerns.

  — *New computing architectures*. One reality of unstructured data is that different computing architectures are needed. Since data storage requirements are increasing at around 80% per year, they quickly overtake the power consumption of computers. Power is a dominant part of data center operating costs, so it is an important consideration.

  > *"There are some very interesting technological opportunities related to how to manage the power and data architecture associated with this flood of information."*
  > — Gregory J. McRae

  — *New analytical methods*. Unstructured data also poses challenges for analytical techniques. Algorithms designed for building regressions and models cannot handle unstructured data. Researchers are now using Bayesian statistics and new data-mining techniques to strip information from unstructured data.

  — *Security risks*. The Internet provides a new vector to break into servers. Unfortunately, good risk models don't yet exist to characterize the downside of different types of breaches. Without understanding the risk, it is hard to develop and invest in risk-mitigation plans. The cloud introduces additional complexities. The terms of service often say that the cloud provider assumes no liability, but CIOs are held accountable for the theft and stability of company information. If physical disks are stolen from a data center, for example, the cloud service provider may not know what was on them and the CIO may not know whether a data breach has occurred.

  > *"Part of the problem we have in this space is that we don't have good risk models to understand the downside of various kinds of breaches."*
  > — David Clark

  — *Data and privacy concerns.* One approach to data and privacy concerns is to give consumers ownership rights and the ability to opt in to different uses of their data.

  For example, consumers could opt into programs that track their Internet usage and display targeted online ads. Although no one has built a differentiated hierarchy of privacy yet, architectures exist that appear promising. These must be developed to determine how people interact with them and the associated risks. Another idea is to give consumers access to all the data collected about them online. This would create a new asset class controlled by individuals. A data market could be developed for this asset, with vendors that help consumers with data portability and protection.

Other Important Points

- **Analyzing unstructured data.** To date, analytics teams have relied on computer science and physics expertise. However, the math underlying those disciplines is not well suited for unstructured data. Information theory math is better for dealing with data that contains a lot of "noise." To analyze unstructured data, electrical engineers and people skilled in signal processing will be needed.
- **Privacy regulations and unintended consequences.** The European Union implemented privacy regulations that severely restrict the use of targeted online ads based on consumers' Internet activity. Once the policy was rolled out, online ads became much less effective because they were less targeted. Companies responded with larger numbers of ads and more intrusive ads, which degraded consumers' online experience.

The Evolving CIO Role in Cloud and Mobile Computing Environment

- Moderator: **David Kingston**, Managing Director, Corporate Executive Board
- Speakers: **Anthony D. Christie**, CIO & CTO, Global Crossing
  Mark Egan, CIO, VMware
  Sanjay Mirchandani, CIO & COO, Global Centers of Excellence, EMC Corporation
  Tasos Tsolakis, EVP & CIO, Iron Mountain

Overview

Cloud and mobile computing enable companies to extract business value in a variety of ways, such as reduced costs and increased organizational agility. However, these benefits are accompanied by a host of complexities. IT leaders must deal with technical issues such as system integration and migration of legacy applications.

In addition, the relationship between IT and business users has changed dramatically. Above all, CIOs must provide technologies that reduce friction and are easy to use. IT leaders also need to address human factors related to leadership and talent management. CIOs must cultivate teams that understand the business and act as change agents.

Context

The panelists discussed how cloud and mobile computing are changing the nature of business and how CIOs are managing IT organizations.

Key Takeaways

- **CIOs are using the cloud and mobility to drive cost reductions, and to increase efficiency, quality of service, and agility.**

  While organizations are capturing the value of the cloud and mobility in different ways, most CIOs are focused on increasing company agility. The journey to the cloud can be divided into four phases:

  1. *Identifying the business problem*. Before moving to the cloud, organizations must identify what business problem they want to solve.
  2. *Becoming familiar with the technology*. Through consolidation and virtualization across the enterprise, efficiency gains and cost savings are possible.
  3. *Moving critical applications to the cloud*. In this phase, applications like email and CRM are moved to the cloud. Organizations begin to move much faster.
  4. *Focusing on agility and speed*. As companies gain agility through the cloud, they must implement governance processes so resources aren't wasted.

  The panelists are using the cloud and mobility to reduce costs, increase efficiency, and improve agility.

  — *Global Crossing's private cloud*. A year ago, Global Crossing decided to place its internal communications and collaboration functions into a private cloud. The company moved its audio conferencing bridges into the enterprise network and placed them in a hosting zone. Three important lessons emerged from this initiative:

  1. The user experience improved.
  2. Supply chain costs have been reduced by around 25% over a six-month period.
  3. A platform has been developed for other hosted communications services, like instant messaging, presence, directory services, and telephony.

  Today, 60% of the company's global applications run in the private cloud. The vast majority of new work (90%) is done in the private cloud because it works so well.

  — *VMware's virtualized environment*. Through its highly virtualized environment, VMware has increased its agility and efficiency. Over the past year the company delivered 39 tier-one projects; most (87%) have been on schedule and within budget. The business case for business intelligence, for example, was $50 million in incremental revenue over three years and $7 million of savings.

  — *EMC's quest for quality of service through the cloud.* EMC's cloud journey began in late 2004 when the IT organization asked whether internal users would use EMC as a technology provider if other choices were available. Based on this feedback, the company embraced virtualization and the cloud, which drove efficiency, agility, and quality of service across the business.

  > *"In this day and age, I'd challenge anyone not to have efficiency top of mind. But you have to get beyond that quickly and that's agility."*
  > — Sanjay Mirchandani

  — *Iron Mountain's combination of public and private clouds*. Iron Mountain hosts some applications in a private cloud, but it also uses service providers. For customer-facing solutions, the company uses its own private cloud for information management.

- **Although the cloud holds great promise, it may not be the right solution for every situation.**

  The cloud provides great benefits, but IT leaders must be aware of issues related to costs, integration with internal systems, and migration of legacy applications. The

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panelists described factors that may influence or hinder the adoption of cloud-based solutions.

— *Public cloud applications can be expensive*. Many best-in-class applications exist in the public cloud and provide quick solutions for companies. In some cases, however, they are not the least expensive solutions.

— *Cross-system interoperability is often an issue.* Cloud application front ends are often easy to use, but considerable back-end integration work may be needed. When selecting best-of-breed, public cloud applications, it is important to confirm that they don't run in isolation. The panelists predict that over time more seamless connections and greater data connectivity will evolve between public and private architectures. For this to happen, however, standards will be needed.

— *Not all legacy applications should be migrated to the cloud*. Although organizational agility is critical, flexibility is also important. Mr. Christie noted that some legacy applications have specific features that are hard to move to the cloud. In these instances, he keeps legacy applications out of the cloud as long as possible. Mr. Tsolakis agreed that the cloud is not always the right solution. In some cases, Iron Mountain has combined cloud and hosted applications to reduce costs. In other instances, it has integrated legacy applications through web services. This provides access to functionality in a different way and the business doesn't know there is a legacy application behind it.

> *"The cloud is not going to solve all of the complexities that we have and we need to be up front, helping the business move through the change."*
> — Tasos Tsolakis

- **IT leaders must adapt to new leadership challenges driven by changes in technology and user needs.**

Today employees have access to more technologies than ever before. As a result, the relationship between the IT function and business users has changed dramatically. The panelists discussed different management and leadership challenges that CIOs must now address.

— *The IT department's monopoly is over*. Since the business community can now access more technology options, the IT department's monopoly over users no longer exists. When it comes to mobile devices, end users want freedom of choice. Software-as-a-service offerings provide appealing alternatives to legacy applications. To derive more value from legacy systems, IT must re-platform or virtualize them and modernize their user interfaces. In the infrastructure layer, IT must optimize between private and public clouds.

— *Conversations must shift from optimizing IT production to business consumption*. The IT department needs to understand what business capabilities the organization needs and how users interact with existing systems. This requires a cultural transformation. IT must move from project conversations to conversations about capabilities and service consumption.

— *IT has to lead the organization through technological change*. The cloud will not solve every complexity. As a result, IT must be proactive and lead the business through technological change.

- **To promote innovation among knowledge workers, IT departments must focus on ease of use.**

Cloud and mobility-based solutions can drive innovation among knowledge workers. However, IT organizations must be flexible enough to meet employees' needs. Since device proliferation is undeniable, companies can either fight it or harness it. In reality, individuals create most business information today, while corporations manage it.

CIOs and their teams also must determine how to remove the friction associated with IT. Examples of friction are multiple system logins, data transfers, and unsupported devices. In the consumer world, technology is easy. Training and manuals are unnecessary. Ease of use is essential to promote innovation by knowledge workers.

For example, VMware just replaced its legacy support system with a cloud-based application. Although the legacy system had more functionality, the user interface was terrible. Because the cloud-based solution was easy to use, the business leader believed adoption would be very high. With the new platform, the company could make changes much more quickly than in the past.

> *"In the consumer world it's easier. They collaborate, there's no training, there's no manuals, you just sit down and you use it. We've got to drag that into the enterprise."*
> — Mark Egan

- **In the world of cloud and mobility technologies, CIOs need teams with different skills.**

With cloud and mobility-based technologies, IT professionals need new skills. CIOs must determine how they will develop those competencies in their staff. The panelists described how IT careers are evolving and which capabilities will be essential in the future.

— *Well-defined career paths are a thing of the past*. Technological advancements are creating new and unconventional IT roles. Cloud architects, for example, break down traditional silos and look at everything from the infrastructure to applications.

— *CIOs need functional analysts who understand the business*. As the line between technology and the business becomes blurred, IT must be seen as a partner that understands the business. Cloud architects, data center architects, and service managers are all business managers, not project managers.

> *"I want people who understand the business. I want my IT department to be increasingly seen as a partner and to be conversant in the terms that are important to the business."*
> — Anthony D. Christie

— *IT professionals must know how to coach and disseminate information to the broader enterprise*. Recent research among knowledge workers and productivity published by The Conference Board showed that it is important for data analysts to know how to coach knowledge workers on the use of technology. The majority of failed IT initiatives lack knowledge worker capability.

— *CIOs must cultivate change agents*. It is necessary to empower the best and brightest team members. When people have the freedom to innovate, they become empowered as change agents. Becoming empowered means being permitted to make mistakes.

Other Important Points

- **Storage in the public cloud.** Sensitive information, such as payroll data, is often stored in public cloud applications without any problems. However, organizations may want to avoid the public cloud for applications that require extreme performance or that contain customers' data.
- **Security in the cloud.** Security in the cloud must be built in, rather than bolted on. It is possible to build in security at the information layer, not just the physical layer.
- **Baselining service level agreements (SLAs).** With cloud offerings, some organizations are concerned that they don't own the stack and don't know what the SLAs are. Before moving to the cloud, EMC baselined its SLAs. This enabled the company to determine what level of service it was willing to pay for as it moved to the cloud.
- **Dark fiber.** Since continually upgrading infrastructure can be burdensome, some CIOs are buying more dark fiber to future-proof their systems.

New IT Innovation Models

- Moderator: **Roger P. Roberts**, Partner, McKinsey
- Speakers: **Prof. Michael A. Cusumano**, *Sloan Management Review,* Distinguished Professor of Management, MIT Sloan
  Arthur Filip, VP & GM, Technology Consulting, Hewlett-Packard Co.
  Roy Rosin, VP, Product Management & Innovation, Intuit
  Alan Trefler, CEO & Founder, Pegasystems

Overview

Innovation is the creation and capture of value from new ideas. And technology plays an increasingly important role in enabling that process. The first step is shifting to a customer-centric perspective, an approach that standardizes software and platforms across multiple channels. Moving to a more flexible IT development approach also stimulates and improves innovation.

Increasingly, companies need leadership focused specifically on innovation. Going forward, many CIOs will take on that role. As such, they must support organizational changes that encourage accelerated identification, vetting, and implementation of new ideas.

Context

The panelists discussed how technology and leadership support innovation in the business world. They also discussed innovative practices in IT development.

Key Takeaways

- **Organizations that excel at innovation employ a fundamental framework.**

  When examining innovative organizations such as P&G and Google, a pattern emerges that encompasses these areas:

  — *Culture of innovation.* Inventive organizations look closely at what they measure and what they celebrate. For example, do the metrics promote new sources of revenues or time to market?

  — *Small teams.* Generally, successful organizations favor small teams with diverse members.

  — *Structured idea selection.* Prioritization of ideas is a critical component of successful innovation.

  — *Rapid validation.* The point is to learn as much as possible as quickly as possible, at the lowest possible cost. It's about making many small bets and quickly assessing whether those assumptions are correct.

  > *"You can't just put the hundred million dollar salesman up on stage. You also have to celebrate the guys who did rapid experiments to test new ideas quickly."*
  > — Roy Rosin

- **Technology can improve innovation cycle time.**

  The panelists offered varying definitions of innovation, but all supported the idea that using technology to help people act on ideas quickly and efficiently is critically important.

  Roy Rosin talked about Intuit's development of Brainstorm, an idea-management platform that connects ideas with the people who are best able to improve them or take action on them. Intuit built this platform for its own internal use, but is now licensing it to other enterprises.

  > *"The reality is that employees are spread across the world now. Trying to innovate over a conference call or a cell phone is a tough challenge."*
  > — Arthur Filip

  The panelists agreed that moving to a more flexible approach in IT development is part of the process for streamlining innovation. Historically, most companies operated with a sequential design process that involved significant upfront planning and oversight. Today, more companies are moving to a scrum approach. This is an incremental development process that allows self-organizing teams to work on small, defined tasks.

  Professor Cusumano noted that his research shows the majority of projects around the world today use some kind of iterative or agile development approach.

- **Platforms must deliver the same process across multiple channels.**

  Traditionally, people have thought of platforms as a way to build applications within organizational silos. For example, a retailer might develop several point-of-contact platforms: one for its customer contact centers and another for its website. Alternatively, a bank might develop several product-based platforms: one for credit card customers and another for loan customers. Today, the most innovative companies are realizing that customers want a seamless transition between platforms.

  > *"Platform is a way of thinking about how you organize a problem."*
  > — Alan Trefler

  Mr. Filip pointed out that the platform focus has shifted toward an "ecosystem" approach that includes people and information both inside and outside the enterprise.

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- **Innovation leaders must create the right conditions for success.**

  Because of the significant part that technology plays in innovation, many CIOs will assume a leadership role. The panelists discussed strategies that will help CIOs achieve success as leaders:

  — *Changing the culture.* Alan Trefler noted that it is possible to take steps that will "bake innovation into your culture." He cited the president of Medco, a $70 million company growing at 10–15% per year, as an example. The top Medco executive wanted his IT and business units to change the way they worked together, so he created the Business and Agility Center, taking 800 people out of IT and co-locating them within business teams.

  Now Medco has business people in constant interaction with the people doing implementation. That allowed the company to set an ambitious goal for this center: return $900 million a year by "automating everything that can be automated" in the customer pipeline.

  — *Defining outcomes.* Companies that are successful innovators understand what it is they are trying to improve. At Intuit, in the tax area, the goals are to decrease the time it takes users to pay their taxes and increase the size of their refunds. In the small business area, the goal is to make small businesses more profitable. Those goals provide all of the initial guidance that is needed.

  — *Using the right metrics.* The metrics used to measure innovation often evolve as an innovation matures. In the beginning stages of innovation efforts typical metrics focus on participation or engagement. As innovation efforts progress, many organizations attempt to measure conversion, or how many ideas are implemented. Many also look at velocity: how quickly ideas are tested, invested in, and launched. A year or two later, innovation metrics are similar to shareholder metrics, looking at criteria like return on investment.

  Successful companies also rely on qualitative measures. Simply asking people if they would recommend the organization as a great place to experiment and innovate can yield valuable information.

  — *Executing good ideas.* Far too many organizations develop good ideas but fail to act on them. Mr. Rosin said that Intuit has achieved tremendous growth in its core business through a process of continuous improvement, which involves effectively executing good ideas. TurboTax, for example, is a mature product that now offers new data-entry mechanisms such as pictures, voice, and graphics.

  However, Professor Cusumano cautioned that continuous improvement can go too far. If there is too much churn in the platform, it makes it hard for people to innovate around it. And changes can create problems such as software interfaces that are not compatible going forward and backwards. So as continuous innovation occurs, some amount of stability is desirable.

  > *"[We should make a distinction between] invention, innovation, and exploitation. Somebody's got to run the factories."*
  > — Michael Cusumano

  — *Allocating resources efficiently.* The ideal is crafting and creating an environment where people can drive many ideas forward incrementally, gathering as much evidence as possible along the way. That enables decision makers to understand where to invest.

Other Important Points

- **Predictive markets.** Predictive markets—using collective intelligence to forecast outcomes—can help development teams make decisions. For example, a team's collective wisdom about release dates typically will be quite accurate. But Mr. Rosin doesn't believe collective intelligence is as helpful for sifting through innovation ideas at the organizational level.
- **Best in breed.** Companies with duplicative software or platforms that are wondering whether to abandon redundancy in favor of best-in-class or best-in-breed solutions should stick primarily to core business areas where the payoff is greatest. Professor Cusumano said that decisions about non-core areas will become easier in the future as more software moves to the cloud.
- **Governance challenges.** Governance over industry-wide platforms is more of a challenge than it is for internal platforms. In many cases, the government or some organizing body has to step in. Professor Cusumano predicted that kind of intervention will happen soon in defining standards for handling digital records.
- **Workforce changes.** Companies will struggle to adapt as more young people—who have had a device or keyboard in their hand since they were 12 months old—enter the workforce. The demand for real-time information will grow significantly.

Mobility—The Next CIO Innovation Opportunity

- Moderator: **Susan Nunziata**, Editor-in-Chief, *CIO Insight*
- Speakers: **Dr. Narayanan Krishnakumar**, VP & Chief IT Architect, EMC
  Lisa Mitnick, Executive Director, Accenture
  Lior Netzer, VP of Mobile Network Strategy, Akamai
  Marilyn T. Smith, Head of Information Service & Technology, MIT

Overview

Mobility is transforming enterprises and is the next major innovation opportunity for CIOs. It is fundamentally changing the way information is produced and consumed, as well as the way people work. Mobile apps have evolved from basic business functionality to solutions that are closely integrated with essential business systems, like ERP and CRM packages.

This new reality is changing how CIOs work. Greater collaboration is needed with leaders throughout the organization to develop coherent mobile strategies. In addition, security concerns have increased. CIOs must secure sensitive data, manage access control, and educate users about good security practices.

Context

The panelists discussed how mobility is the next technology frontier and how CIOs can promote innovation in this space.

Key Takeaways

- **Mobility is transforming how organizations interact with employees and customers.**

  Mobility is more than just a channel; it is transforming how enterprises do business. Enterprise mobility spans business to employee (B2E), business to business (B2B), and business to consumer (B2C). It also applies to a variety of devices, ranging from cell phones and smartphones to tablets and machine-to-machine devices. When asked to define enterprise mobility, the panelists made the following observations:

  — *The mobile revolution represents a fundamental change in the consumption and production of information*. Because 3G and 4G carriers offer unlimited data plans, mobile devices have become pervasive and consumers use them for many purposes. At MIT, students are driving the enterprise mobility strategy. The school has launched mobile applications that make it easier for students to get around campus and do their day-to-day work. MIT's mobile strategy also includes capabilities for support staff. The organization is currently working on an application with a special device that is integrated with the ERP system. This will make it easier for facilities employees to do their jobs.

  — *Enterprise mobility is leading to a new work paradigm*. With mobile devices, work is no longer a place where employees go. Instead, work is about what employees do. EMC, for example, has implemented the WorkWise program. The goal is to enable employees to work anyplace, anytime, and with any type of device. People can move around buildings seamlessly without repeated logins to the company's virtual private network (VPN). In addition, they can access the company network from home, a kiosk, or a customer site.

  > *"Mobility is definitely contributing to a new paradigm of work. At EMC, we have a WorkWise program, which allows people to work from various places."*
  > — Dr. Narayanan Krishnakumar

  — *Employee choice is at the center of enterprise mobility*. People are more likely to use mobile devices in the workplace if employers give them the freedom to choose their own devices. Akamai and many other organizations have a "pick your own phone" policy.

  > *"I think enterprise mobility is about creating more desire for employees to use mobile because they feel the organization is flowing with their needs, rather than them having to adapt to the organization's needs."*
  > — Lior Netzer

- **Business-oriented mobile apps are evolving from basic functions to more sophisticated applications.**

  The nature of mobile apps in the workplace is changing dramatically. In the early days of the technology, applications replicated basic business functions, such as email or online calendars. Today, new mobile apps provide more sophisticated functionality. They are designed to improve employee productivity, boost sales, and support "green" business practices.

  The panelists provided examples of mobile apps being used by employees in different industry segments:

  — *Field employees*. Providing employees with information at the point of activity is very powerful. Mobile apps have been used effectively with field employees in several industries, including utilities and construction. Technical consultants at EMC have an app that is used to report back on their workflow.

  — *Sales teams*. Many sales teams use tablets to work more efficiently. With tablets, pharmaceutical sales reps can show presentations rapidly and capture physician

signatures. At EMC, the sales force uses a mobile app for lead generation and opportunity management.

— *Administrative tasks*. Mobile apps have been developed for administrative tasks like expense reporting and locating conference rooms on a corporate campus.

— *Specialized tasks*. Many physicians now use tablets to access patient data. This facilitates more collaborative interactions with patients. Mobile technologies also have environmental benefits. Accenture, for example, developed an application for boards of directors. Board members use a tablet to access digital board meeting materials and to take notes. This eliminates the need to print large volumes of information.

- **Enterprise mobility requires CIOs to focus more on collaboration and governance structures.**

As mobile apps become more sophisticated, CIOs should collaborate more closely with leaders in other functional areas. Mobility cannot be its own island. To be successful, it must integrate with back-office functions and end-to-end business processes. The entire leadership team must develop a coherent mobile strategy that articulates the benefits for the organization delivered by mobility.

> *"I think you're going to see increasing amounts of collaboration. Otherwise, there's going to be a waste of resources, time, and energy—no company can afford that today."*
> — Lisa Mitnick

CIOs also must implement mobility governance structures that manage security and protect both intellectual property and physical assets. Striking a balance between what should be controlled and what should be allowed is a major challenge. Unless governance structures are flexible, experimentation and innovation will be stifled.

EMC is developing a governance model centered on the motto "don't hold my data hostage." The IT team assumes that every app will be mobile and also available on larger-footprint devices. This has led to an architecture based on a web service back-end that accesses data appropriately.

- **CIOs can't ignore security issues related to mobile.**

Although mobile devices can enhance employee productivity, security is a real concern. Android-based consumer apps, for example, may pose security problems when smartphones are connected to a VPN. Until innovative solutions are developed to ensure security, CIOs must take steps to protect enterprise applications and data.

Organizations are using a variety of approaches to address mobility-related security issues:

— *Handling lost devices*. Accenture offers mobile application device-management solutions that enable organizations to wipe lost devices.

— *Managing access control*. EMC uses a virtual desktop infrastructure to separate the portion of mobile devices that are personally owned. Eventually the company wants to develop a device-management solution that recognizes devices, assesses them, and determines what level of network access is granted. Accenture's mobile application device-management solution has a built-in app catalog. This manages which users have access to different applications.

— *Securing sensitive data*. MIT has determined which data needs to be secure. For example, students can view grade or registration information online, but they can't download the data. In areas where the network must be open, firewalls and other tools have been implemented to protect data.

> *"I think you need to secure the network. We have an open network and we recognize what data needs to be secure and what data doesn't."*
> — Marilyn T. Smith

— *Educating users*. Although MIT does not control devices used on its network, it promotes security by educating users about tools like encryption software.

- **Strategic plans must consider the future of mobility.**

CIOs must acknowledge that mobility's explosive growth will only continue. The panelists made several predictions about the mobility space that may affect companies' plans.

— In three to five years, *every house will have five to ten devices with a SIM card,* such as smartphones, laptops, tablets, and televisions. Users will have a consistent experience as they move from one device to another.

— *Mobile is the fastest-growing segment of Internet traffic.* In five to ten years, mobile could account for 50% of Internet page views.

— In the near future, *3G and 4G technologies over cellular will deliver* the seamless mobility that is currently available in the U.S. through wifi.

— *Video will become pervasive and will converge with mobile.* The network will be critical to video.

— *Mobile payments and commerce are an exciting area.* Companies should consider mobile couponing and loyalty payments. These can transform the relationship with customers and drive a new paradigm.

Other Important Points

- **iMobileU.** This is an open source site where approximately 100 universities, including MIT, share mobile apps.
- **Shadow IT.** Dr. Krishnakumar used this term to describe applications that have been developed within EMC but are not officially supported. Because mobility is cool, it is a shadow IT magnet.
- **Corporate mobility leaders.** Lior Netzer anticipates that over the next year or two, mobility will become a higher priority within corporations. He expects that companies will hire Directors or VPs of Mobile Strategy.

Workforce 2015—Building the Organization of the Future

- Moderator: **Dr. Jeanne W. Ross**, Director, CISR, MIT Sloan
- Speakers: **Shawn Banerji**, Managing Director, Russell Reynolds Associates
  Coco Brown, President & COO, TAOS
  Steven John, Strategic CIO, Workday

Overview

The workforce of 2015 is already in evidence today. The new ways of working facilitated by social networking, mobile apps, and cloud computing are not fads but lasting trends that will be even more pronounced by 2015. These trends are shaping workers' attitudes, behaviors, and expectations of organizations.

Technological advances are driving transformations of organizational and leadership models as well. A major shift is going on, away from controlling employees and toward managing ecosystems of distributed workers collaborating on projects via systems and platforms residing in the cloud. CIOs have roles to play in facilitating and integrating that will drive their own transformations as well.

Context

Prompted by questions from Dr. Ross and members of the audience, panelists shared perspectives on the workforce of 2015, covering what aspects will be different and the implications for leaders generally and CIOs in particular.

Key Takeaways

- **IT-driven changes in how people work will become even more pronounced over coming years.**

  The workforce of 2015 and beyond should be shaped by trends already in evidence that are likely to become even more prevalent. These include:

  — *Everyone is networked, so organizations are running 24/7.* The lines between work time and personal time are blurring. "The notion that personal things get taken care of during personal time is a thought of the past," said Ms. Brown. "If you need some of my evenings and family time," workers are reasoning, "I need some of your days."

  — *Use of email is on the decline.* It is being replaced by communication tools like instant messaging, social networking, Skype, and document sharing in the cloud.

  — *Work teams are increasingly dispersed and global.* Teams are being formed and disbanded for a particular project, with the individuals chosen more by skill and less by functional domains. Use of independent contractors and freelancers is escalating.

  — Workers are increasingly self-enabled and entrepreneurial. Many are marketing themselves and their own ventures outside of their day jobs. Tools and services in the cloud are enabling this (e.g., Box.net, LinkedIn and Facebook, Elance.com, salesforce.com). Many people now give out two business cards, one representing their job and the other their passion.

  — *Three generations with very different expectations and values are working side by side:* Baby Boomers, Gen Xers, and Millennials. Managers' ability to lead them all and organizations' ability to embody the values of all will be critical to attracting and retaining talent.

- **New ways of working are changing how organizations function and how managers lead.**

  Some companies are grappling with why employees need to be networked and how much to try to control it. But it can't be controlled. Workers are now equipped with their own devices and can access whatever they want through the cloud, at any time and from any location, regardless of their company's policy. They can get from the cloud whatever they need to do their work, whether or not IT departments provide help.

  Savvy businesses are increasingly viewing employees as free agents and realizing that embracing technology-enabled changes in how people want to work can benefit the organization. Organizations that permit employees to figure out personal schedules that work best for them are rewarded with increased dedication and productivity. The opposite is also true as "people who feel gypped will gyp you," said Ms. Brown. Moreover, when organizations run 24/7, management must always be "on." For managers this can be exhausting, unless they relinquish control to workers. Measuring productivity and outcomes becomes critical, which requires replacing old habits and controls such as actually seeing people in their cubicles.

  Command-and-control structures are not well suited to new ways of working. Organizations are learning that they don't need to control employees as much as they need to control knowledge. That includes managing the transfer of knowledge among individuals, retaining knowledge assets, and being able to access the particular types of expertise needed at a particular time.

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> *"What businesses are recognizing is that it's not important to own the employee; it's important to have good processes for retaining continuity and knowledge handoff, ensuring that you get good results, and owning the results."*
> — Coco Brown

Companies of the future will be decentralized ecosystems of talent and technology. Employment models will include more independent contractors. Home-based workers' services will be bid upon by companies all over the world. Internal social networking platforms will allow more one-on-one communication with top management as well as interactions and assignments shaped by employees' personal likes and dislikes.

This new type of decentralized organization will challenge old models of leadership. Emotional ties to managing by seeing will have to be broken. Among the leadership skills that Ms. Brown sees mattering most will be facilitating collaboration among cross-functional, distributed teams. Mr. Banerji believes that a core leadership challenge for CIOs will be developing the competencies to lead several generations simultaneously and crafting management strategies that reflect the distinct needs of each.

In a world with decentralized organizational models, Mr. Banerji sees the potential for a very different type of corporation. Complying with countries' different labor regulations could force global firms to assume greater accountability for employees' education, healthcare, and other needs. Very large global enterprises will assume greater control over employees. They will offer employment for life and will provide a fulfilling life, with rotational assignments and opportunities for individuals to learn and develop.

- **CIOs have facilitating and integrating roles to play in helping organizations make these transitions.**

  CIOs will be critical players in helping their organizations transition to new ways of operating. CIOs will need to structure processes and IT solutions for the ecosystem of outsourced people, systems, and platforms. They will play roles of facilitating collaboration and integrating systems. The ability to integrate servers and cloud platforms in complex corporate ecosystems will be highly valued.

> *"It's not just employees who compose our teams anymore. . . it's an ecosystem you're managing and getting to perform at its highest level."*
> — Steven John

Important new skills will include the ability to do due diligence on external systems in the cloud in order to fully understand how these solutions will function before the organization makes large commitments to them. CIOs will need to train IT staff with the new skills that will be needed; some companies may partner with higher ed institutions to meet their training needs.

Certain IT skills will no longer be required, especially in companies where technology is not core to revenue generation. CIOs may find that independent contractors who have worked for many diverse organizations have skills better suited for a world where technology changes so rapidly. Preparing staff for these transitions will be a challenging part of a CIO's job.

The role of CIO is also undergoing dramatic transformation. In the past a great CIO was a great operator; a key relationship was with the CFO because technology was a vehicle for managing expenses. The future will require CIOs who can innovate to strategically accomplish business objectives and create value.

Going forward, the relationship with the chief marketing officer may be more critical than with the CFO. Because cloud computing enables workers to be more self-sufficient and less dependent on IT departments to get things done, it is freeing up CIOs for more strategic work.

> *"Today, the premium is on business strategy, on innovation, on contributions that directly impact desired business outcomes."*
> — Shawn Banerji

Competencies that more strategic CIOs will require include business acumen, credibility, communication, people skills, ambition on behalf of the organization, and foresight.

Other Important Points

- **Team trust.** To help distributed teams form relationships that build trust, Mr. John said, "I like to get teams together physically at the beginning and end [of a project]." Ms. Brown echoed the importance of meeting physically. Relationships are the way to build trust, she said.
- **The government piece.** An audience participant said that the U.S. Department of Labor and the IRS frown on independent contractor arrangements, preferring workers to be protected by employer-provided benefits as well as family leave and other labor laws. Mr. John acknowledged that this is a problem for the flexible workforce model that is envisioned, even more so in other countries, like Germany. Corporations' and governments' views of workers will need to be reconciled in workable ways. How the issue plays out may determine how and where companies do business in the future.

Collective Intelligence and Social Networks

- Moderator: **Brian P. Watson**, Director of Business Outreach, Workforce Opportunity Services
- Speakers: **Adam Boyden**, President, Conduit
  Robert Laubacher, Associate Director, MIT Center for Collective Intelligence
  Dr. Andrew McAfee, Principle Research Scientist, MIT & Fellow, Berkman Center for Internet and Society, Harvard Law School
  Rob Stefanic, Vice President & CIO, Sensata

Overview

Collective intelligence—gathering the wisdom of the crowd—is not a new concept. New are web-enabled collective intelligence tools that offer the ability to quickly and inexpensively gather input from large numbers of people.

Although adoption of so-called crowd sourcing and open innovation tactics has been slower than expected, new research and positive results from field testing are driving renewed interest. The data show that most collective intelligence is in fact quite intelligent. As a result, many organizations are experimenting with using both external and internal networks to accomplish diverse goals, such as open innovation, predictive analysis, and knowledge sharing.

Context

Brian Watson, formerly editor-in-chief of *CIO Insights*, moderated this panel discussion on issues related to collective intelligence and social networks: what has been holding companies back and how they are moving forward.

Key Takeaways

- **Businesses could move faster in adopting collective intelligence or open innovation concepts.**

  Some of the issues holding businesses back include:

  — *Reluctance to give up control.* Much of the publicity surrounding the open source world describes it as sort of a free-for-all. The reality is far different. Consider the Linux operating system, which allows anyone to contribute an idea or suggest some code. However, a formal group of reviewers carefully vets everything before deciding what goes in.

  > *"A combination exists of opening things up in some parts of the process and having tight controls in other parts. If people understood that better, they would be a little less freaked out."*
  > — Robert Laubacher

  — *Interference from misinformed business leaders.* Unrealistic demands from business leaders who think they know the impact of collective intelligence or social media can keep the technology from catching on. It leads to a response of "I'm doing this because I'm being told I have to," instead of a collaborative response with IT at the table saying, "This is what we should be doing. Here's the way to do it."

  — *Concerns about liability and governance.* Sometimes it's the IT people who get in the way. Real evangelists or go-getters in an organization will say, "Well, I took it to my CIO and that's pretty much where it stopped." But concerns about security, privacy, and compliance—both legitimate and otherwise—often get in the way.

  — *Lack of follow-up.* Many companies have built a whole bunch of tools to take advantage of the collective intelligence of their customers. But they lack the ability to do anything with the data; there is no feedback loop to then change the experience customers are having. So, the companies invested in tools, yet customers end up less happy than if the company had not acted at all.

  — *Conflict between marketing and IT.* In organizations trying to engage with consumers and gather collective intelligence, two camps get involved—technology and marketing. The problem is that they don't understand the other's issues. Marketing wants everything tomorrow because they think it's easy. Meanwhile, technology is wrestling with the problem of how to access and use unstructured data from multiple silos. Until decision makers understand this conflict and agree on what the overall goal is, organizations will lag behind.

- **Despite the obstacles, businesses are starting to accept the idea of collective intelligence.**

  New research is helping people understand how collective intelligence works and what its benefits are. There has even been great work done in pattern analysis. Mr. Laubacher referred to this research as the "genome of collective intelligence." Business leaders who hope to take advantage of social media are using those patterns to guide collaborative projects.

  Also, companies that offer access to established communities are emerging. For example, a company called Top Coder that does software development is using a contest-based model with a network of more than 300,000 coders.

  > *"We're using large, specialized crowds to solve problems. Instead of having a group of 50 or perhaps 75 potential developers, we're accessing a pool of several thousand experts."*
  > — Rob Stefanic

Another reason for the increasing acceptance of collective intelligence is that more businesses are starting to make data-based decisions. Dr. McAfee explained that most decision making in organizations historically was done by "hippos"—highly paid executives. After all, intelligence and crowed-based knowledge was difficult to come by, so it made sense to listen to people with proven records. Today, however, more organizations allow data to drive their decision making.

Mr. Boyden told this now-classic story: Executives at one of the big social gaming businesses base almost every decision on intelligence gathered about how users behave. When a board member suggested to the CEO that the company should "move the cow from the left-hand side of the screen to the right-hand side of the screen" to improve the user experience, the CEO quickly asked a staffer what the data showed. The staffer banged away on a spreadsheet for a few minutes and came back and said, "It'll drop your average revenue per user by 0.1%."

- **Using collective intelligence to predict outcomes is an effective strategy.**

  Leading-edge organizations have already adopted crowd-sourcing tactics for intelligence gathering. Some common applications include:

  — *Manufacturers estimate how many units to produce* by asking groups to "buy and sell" securities based on expectations of how much will sell next quarter.

  — *Real estate analysts predict housing prices* three months out by looking at Google searches related to buying and selling houses.

  — *Entertainment analysts predict how well a Hollywood movie will do* by looking at the Tweet stream when a movie opens.

  Mr. Stefanic noted that his company is starting to create predictive market analyses by "mashing" internal supply chain and point-of-sale information with readily available external market data. The plan is to use the information internally and as a value-added service for customers.

> *"We don't need to keep asking ourselves 'Does this stuff work?' The evidence is absolutely overwhelming."*
> — Dr. Andrew McAfee

- **Internal social networks can improve communication.**

  Organizations have massive amounts of knowledge-based resources, some on paper and some between people's ears. The challenge is to make those resources available to everyone in the company. Attempting to catalog those resources, in effect becoming a librarian, is a poor approach. Much better is building a digital environment so that information can be easily broadcast and retrieved.

  An example is Tata Consultancy Services, which employed more than 170,000 consultants worldwide in 2010. Tata implemented a relatively simple ask/answer communication tool. In addition, the company also created a leader board that enabled participants to increase their status and reputation within the organization based on their answers. Just six months after implementing this tool a new server had to be installed because the system was so popular.

> *"[Rewards don't have to be monetary.] People will do nearly anything to add a little icon next to their names. I'm not kidding."*
> — Adam Boyden

- **IT executives must gain stakeholder buy-in.**

  Despite proven successes, many IT executives still have trouble convincing users and decision makers that internal networks that provide collective intelligence are a good investment of time and money. The panelists offered several tactics to overcome resistance:

  — *Provide incentives.* Adding rewards can improve the level of participation in a collective intelligence effort and the quality of results among users. Gaming elements are particularly powerful.

  — *Keep it simple.* Too many enterprise tools are completely opaque. No one goes to a four-hour Facebook training session. Management needs to lead by example and not generate 40-page compliance documents.

  — *Give them a way to say yes.* With daily media reports on the power of collective intelligence, most decision makers are slowly coming around. Speed things up by providing case studies and bottom-line data.

Other Important Points

- **Unstructured data pools.** From a computer scientist's point of view, data pools from collective intelligence are intellectually challenging. Dr. McAfee said that unlike conventional data pools—which tend to be small, clean and well-structured—the new pools are big, but are shallow and ragged in many ways.
- **Employee-owned devices.** The proliferation of employee-owned devices creates liability concerns for organizations. Mr. Stefanic said those concerns prevent many organizations from allowing the tools to be self-administered.

Enterprise Analytics→Business Values

- Moderator: **Michael S. Hopkins**, Editor-in-Chief, *MIT Sloan Management Review*
- Speakers: **Rock Gnatovich**, SVP & COO, Spotfire, TIBCO Software Inc.
  Brad Peterson, CIO, Charles Schwab
  Sid Probstein, CTO, Attivio
  Renée Romano Nocker, Director of Technology Product Marketing, SAS

Overview

Few organizations are using analytics to their full potential. They are using data to report on the past, but not to optimize the current, predict the future, or make data-driven decisions. And analytics are rarely embedded in an enterprise's business processes.

Impediments include lack of infrastructure to collect data, lack of skilled personnel, and tools which can be hard to use. However, the most significant impediment is a lack of understanding among executives regarding how analytics can drive business value.

Adoption of analytics requires demonstrating the value of data to solve business problems. Identify hard-to-solve problems where data and analysis can make a difference. Start small, quantify the value, and get executives to see the value. When they do, they'll never go back.

Context

The panelists discussed the adoption of analytics, the impediments to adoption, and how to demonstrate the value of analytics to senior executives.

Key Takeaways

- **Most organizations are not capitalizing on the potential of analytics to drive business value.**

  The amount of data has exploded. In 2009, more digital information was produced than in all prior years of human history combined. As the amount of data has increased, so too have the tools to analyze it.

  However, few organizations are using this data to its full advantage. MIT Sloan Management Review conducted research that posed the following question to managers: *Imagine an organization transformed by better ways to collect, analyze, and be prescriptively guided by information. How close (on a 1 to 10 scale) is your organization?*

  On average, the 3,300 respondents in this research rated their own organization at 4.5. However, thought leaders—who understand analytics' full potential—say that most organizations are at just a 1 on a scale of 1 to 10.

  The panelists see high levels of variability within and across organizations, with some approaching the ideal and rating a 10, while others have no analytical capabilities whatsoever. Comments from the panelists included:

  — *Definition of a "10":* From Ms. Nocker's perspective, an organization that is a 10 uses analytics in decision making and embeds analytics in its business processes. It gets the right information to knowledge workers at the right level of the organization to act on that data in real time.

  — *Ideal use is limited.* Ms. Nocker has seen organizations that are approaching a rating of 10. But this analytical transformation tends to be narrow, applying to perhaps one specific business problem or business process.

  — *Frustration with BI.* Mr. Gnatovich said that many of his firm's customers are less-than-satisfied with their BI tools, which may not be simple enough or fast enough for broad enterprise use.

  — *Creating an "office for data."* Mr. Gnatovich has seen leading organizations build an "office for analytics" which becomes a go-to resource in an organization to quickly respond to management's analytical questions.

  — *Advantages of young companies.* Mr. Probstein rated his own company a 7. Attivio engages in data-driven decision making and does a great deal of analysis on "things that matter" like product development and customer engagement. He said that since Attivio is a young company, analytics has been part of the culture since the company's inception, and the company is not burden by highly distributed legacy systems that can complicate analytics.

  — *Analytics are related to a company's situation.* Having previously been at eBay (which he rated an "8"), Mr. Peterson said that the company had to innovate because the massive volume of data broke the traditional solutions being used. Now at Charles Schwab (which he rated a "6"), the company is very advanced in terms of customer analytics, but has not used analytics to optimize its marketing, as eBay had done.

- **Several impediments are hindering broader adoption of analytics, particularly management acumen on applying analytics to solve business problems.**

  Multiple impediments were mentioned that are preventing organizations from capitalizing on analytics. Among them:

  — *Collecting data.* In Mr. Probstein's view, many companies do a good job of processing their data, yet organizations often face challenges in collecting data.

He believes organizations that focus on data collection can have a tremendous advantage. This includes unstructured data, such as data from social media.

— *People.* The growth of analytics is hindered because few people can do analytics. The ideal analysts are data scientists who are also domain experts and storytellers. Yet such individuals are rare. Because they are so rare, broader adoption of analytics requires tools and technologies that make analytics easy enough to be done by people who aren't data scientists.

— *Applying analytics to solve business problems.* Ms. Nocker disagreed with the assertion that data collection is the major problem. She has seen organizations build robust data collection systems. However, the issue that remains is pinpointing the precise data that is needed to solve a specific business problem.

> *"To really get value, the approach is not just to collect data and look for correlations, but to look for important business problems to solve."*
> — Renée Nocker

Her perspective is that management doesn't fully understand the power of analytics to solve difficult and meaningful business problems. Many managers think of analytics just as reporting on the past. They don't understand how analytics can be used for optimization and prediction. Management must be educated to understand the power of and possibilities from analytics.

> *"Reporting looks backward. Analytics are all about optimization."*
> — Sid Probstein

Mr. Hopkins cited research showing that data and people are not the most significant impediments to capitalizing on analytics. Research has found that overwhelmingly, the greatest impediment to capitalizing on analytics is lack of management acumen regarding how to apply analytics.

> *"The overwhelming problem identified by respondents is lack of [management] understanding about how to use data to solve business problems…it's not getting the data that is the issue, it is figuring out how to use that data to meaningfully drive business decisions."*
> — Michael Hopkins

- **Securing management support for analytics requires a compelling value proposition.**

  The panelists concurred that the broad adoption of analytics in an organization entails a significant cultural change. Managers must change their mindset from relying on institution to make decisions to making decisions based rely on data. Such a change in behavior won't be easy or quick. Advice on bringing about such a changed includes:

— *Start small and grow.* Ms. Nocker advised "working in pockets" to identify and use analytics to solve small problems. (Mr. Probstein described "analytics sandboxes" that allow for experimentation.) This shows what is possible and leads to contagious growth. She described how a six-person team she managed committed to use analytics to deliver $5 million of value in one year. At the end of the year, her team had produced $22 million in value. The key was finding valuable business problems to solve.

— *Give management data they can't live without*. While most MIT graduates are analytical and quantify everything, Mr. Peterson (a Sloan alum) acknowledged that many corporate leaders don't share this affinity for data. But he argued that if a leader is presented with data that makes them more informed and helps them make better decisions, they can never go back to making a decision without this data.

> *"When you bring [a unique piece of data] into a meeting, a manager sees it, and it tells them something different from their intuition, they say 'Wow, I need to pay attention to that.'…Once you get that data, you can never go back to the other way."*
> — Brad Peterson

— *Latch onto marketing.* Lots of money is spent on marketing, but executives often always know what they are getting. Mr. Peterson advised that projects like developing a mobile app shouldn't come out of the technology budget; they should be funded by the marketing budget. Such apps can include analytics, providing both budget and exposure.

Other Important Points

- **Don't try to organize.** Mr. Peterson said it is impossible for an organization to categorize and organize all of its data, a lesson he learned from eBay's aborted attempt to do so. This is especially true with so much unstructured data, including data from social media and text messages. Analytical tools are being developed that enable analyzing and mining unstructured data.
- **Guided workflow.** In enabling business people to engage in self-service analytics, providing tools with guided workflow is critical to organizing the analytical process and preventing chaos.
- **Analytics for tax deductions.** Intuit uses data from eBay to assist Turbo Tax users in determining the value of their charitable contributions. So, if a user of Turbo Tax wants to know the value of a couch they donated, the software accesses eBay data to provide an estimate.

Managing the Extended Enterprise

- Moderator: **Stuart Scantlebury**, Senior Advisor, Boston Consulting Group
- Speakers: **Marc Ferrentino**, Chief Technical Architect, salesforce.com
  Tim Hebert, President & CEO, Atrion
  Jay D. Leader, SVP & CIO, iRobot and Chairman, Boston SIM CIO Roundtable
  Dr. Theodore (Ted) Piepenbrock, Research Affiliate, MIT Center for Technology, Policy & Industrial Development

Overview

The extended enterprise exploits a variety of technological and political skills to accomplish more than it could working on its own. Once an organization's core assets and competencies are defined and protected, almost everything else is fair game for partnerships and alliances. Trust is a key factor that holds extended enterprises together; trust must also extend to a company's relationship with its customers. If a company violates this trust, extending the enterprise may do more harm than good.

Context

Panelists discussed the advantages, risks, and demands of extended enterprises in today's technology environment.

Key Takeaways

- **The extended enterprise isn't a new concept.**

  Ever since ERP systems such as SAP established standard communications protocols, companies have extended their upstream and downstream electronic relationships with suppliers, bankers, retailers, and other entities. These links were highly structured and largely transactional in nature, specifying when, what, and how information was to be sent.

  The Internet's commercial emergence in the 90s led to a number of marketplaces such as Ariba and CommerceOne, all of which extended participants' enterprises by enabling price discovery and auctions. The Internet's open architecture provided opportunities for corporate IT departments to restructure how they linked to partners.

  In some cases, an extended enterprise operated entirely within a firm's legal boundaries: AT&T at one point operated retail stores, a wireless network, its traditional long-distance services, the Worldnet network, some TV, and even a credit-card operation—all of which functioned as separate companies.

  A public agency can be an extended enterprise, too. The Atlanta Housing Authority, for example, which manages sustainable communities for low-income people, links to more than 60 partners, including property and real estate companies, the mayor's office, the police department, and the public school system.

- **Companies can benefit by leveraging the extended enterprise to focus on what they do best.**

  By identifying strategic differentiators and focusing on core competencies, companies have found they can accomplish almost everything else by collaborating with partners.

  iRobot, for example, considers its product and software design functions to be its "crown jewels," not to be shared externally. But iRobot does no manufacturing and its retail sales are through channel partners. Even pure research is carried out in collaboration with academic institutions like MIT and government agencies such as DARPA.

  > *"At the end of the day a lot of execution happens by people whose paycheck doesn't say iRobot."*
  > — Jay D. Leader

  By concentrating on only a few crucial activities, iRobot conserves capital, strategically marshals its assets, develops and protects its intellectual property, and drives shareholder value.

- **A high-trust consortium offers extended-enterprise benefits to its members.**

  Atrion, an IT-services firm founded 23 years ago, has built a technology consortium called 1nService. This began when Atrion observed the challenges its mid-market clients were experiencing in growing from regional to national to international operations. Starting with four members in 1998, 1nService now includes 40 companies, 125 locations, and more than 2,000 technicians.

  As the consortium expanded, its informality and simple website proved inadequate to handle the communications, search, and feedback necessary. About seven years ago, before the emergence of Facebook, 1nService adopted a social-network platform that enabled members to share best practices and list competencies and certifications. Using this tool, members were able to maintain the strong relationships they had when networking was in-person.

  > *"My fundamental belief is that I'm making a long-term investment with relationships."*
  > — Tim Hebert

  In some ways, this fluid collection of companies, built on intimate knowledge of its members' expertise and track records, can offer clients more than a single large firm. At a competitor such as IBM Global, for example, someone in

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the Boston office is unlikely to know his or her counterpart in Dallas, whereas in 1nService, the parallel relationship is more intimate and is based on long-standing trust and demonstrated performance.

- **Cultivating long-term, trusted relationships is critical for the extended enterprise. Or not.**

Atrion's experience with 1inService demonstrates how crucial high-trust, multi-year relationships are to thriving extended enterprises. A participant's reputation depends on referred partners successfully completing client assignments, even though Atrion has no direct or indirect managerial control. By the same token, 1inService's members must trust that Atrion can "do right" by their clients.

> *"If you can't trust to get quality, if you can't trust that your tools are going to work correctly, then it's not going to work no matter what else you do."*
> — Tim Hebert

On the other hand, iRobot is more cautious about depending on trust to sustain its business—and much quicker to abandon a relationship. A degree of trust and confidence is obviously important when choosing one partner over another, but that trust is subject to review and revision as circumstances change. When a manufacturing supplier cited higher energy costs to boost its prices 35% over one weekend, iRobot decided immediately to terminate the relationship. For iRobot, trust is inadequate when business interests diverge.

> *"Trust is transient; it lasts as long as our interests are aligned."*
> — Jay D. Leader

This varying, long-term vs. short-term orientation may stem from differences between services and products, or from optimistic vs. pessimistic personalities. In both cases, IT leaders agree that trust must be earned, not assumed, and is based on character, actions, and competence.

- **Leaders in extended enterprises require political skills.**

A monolithic, "command-and-control" structure allows leaders to dictate who does what, when, where, and how. In contrast, in an extended enterprise, leaders must work through partners to get things done. This makes the ability to understand and serve other's interests vital. Equally important is knowledge about the personal and business motivations of potential partners, which forms the basis for deciding with whom to work.

A "federal and state" model shows how an extended enterprise can be managed. Some rules are "national" in that everyone must comply; others are "state-level," where local differences are accepted. Which rules are national depends on the nature of the enterprise. For iRobot, all partners must use the same product lifecycle management (PLM) system so that its engineers can move freely throughout the ecosystem; at salesforce.com, Chatter is the standard social platform.

A monolithic firm's IT department may be more concerned with job security than getting a particular task done better, more efficiently, and at lower cost. An extended enterprise, already oriented toward best practices and conversational communications, naturally looks for optimal alternative solutions, regardless of source.

- **Companies should exploit the latest technologies for outreach, but also appreciate the importance of conversational responsiveness.**

In broad terms, applications transitioned from "business logic–centric" in the 80s to "customer-centric" in the 90s to "conversation-centric" today. Underpinning that shift is a social enterprise platform, powered by social networking, mobile technology, and cloud-based services.

Today's extended enterprises use these tools to catalyze, capture, and even analyze conversations with suppliers, partners, and customers—and in the process understand what is happening in their ecosystems. Typically, firms work through a three-tier progression on their way to a fully mature networked enterprise:

1. *Internal.* Deploy a tool like salesforce.com's Chatter to reach across business lines, geographies, and other potential company silos.
2. *External.* Use a private cloud to extend richer communications to suppliers, distributors, and customers.
3. *Combined.* Link the internal and external tools to create three-way conversations.

For example, a medical-device company might have an information site about replacement knees for prospective (and worried) recipients. At the same time, the company communicates with the doctors who are installing the devices. Why not put the company, doctor, and patient together to address concerns prior to surgery? This level of engagement will build brand awareness, provide valuable marketing feedback, and assist the ultimate end user.

> *"What a great concept: Creating a dialogue with your customers on what your next product should be."*
> — Marc Ferrentino

Dell created a site called Idea Storm, which solicits suggestions from customers about future product features, such as which flavor of Linux to include in netbooks. Participants then vote ideas up or down; when an idea reaches a certain level, Dell takes a serious look at it and reports its decision (and reasoning) to the Idea Storm community.

This approach builds loyalty as members are invested in the products they help design. But, it requires a company not only to listen, but also to respond. In this sense, a company's responsiveness and transparency are far more important than its tools.

New Trends in Cyber Security and Privacy Protection

- Moderator: **Owen McCusker**, Principal Analyst, Sonalysts, Inc.
- Speakers: **Allen Allison**, Chief Security Officer, NaviSite
  Michael K. Daly, Director, IT Security Services & Deputy, CISO, Raytheon Company
  Kurt Hakenson, Chief Technologist, Electronic Systems Sector, Northrop Grumman Corporation
  David Saul, SVP & Chief Scientist, State Street Corporation

Overview

A security breach can cost an enterprise millions of dollars and can damage an organization's reputation. A breach can occur in a matter of minutes, can be hidden for months, and then can take weeks to mitigate. At risk are operational integrity, customer account information, corporate intellectual property, and, for governments, national security. In this environment, personal relationships and rapid disclosure among targeted companies and government agencies are just as vital as the latest security technology.

In today's complex ecosystem, there is no "silver bullet" to cyber security. The first line of defense is well-trained employees, supplemented by data-traffic analysis, system segregation, consistent global responses, and a constantly changing mix of new technologies.

Context

Owen McCusker moderated a panel representing financial services, defense, and general business sectors that must deal with ongoing cyber threats.

Key Takeaways

- **For all its challenges, collaboration within and across industries and jurisdictions is essential in responding effectively to cyber threats.**

  Malicious hackers have breached the defenses of one company after another, stealing account information, identity data, and corporate intellectual property. Although victimized IT departments downplay the crimes for customer relations, legal, and even embarrassment reasons, they also recognize that disseminating intrusion details to their peers is the best way to stem broader industry problems.

  > *"We are trending towards security as a platform, a way of collaborating and sharing information among organizations."*
  > — Owen McCusker

  IT managers must cement strategic, collaborative relationships at a personal level well before a crisis occurs. Only then can they feel comfortable disclosing the specifics of a successful hack to a potential competitor. Personal relationships based on trust and reciprocity may prove more useful than formal channels when the rapid containment of malware is essential.

  > *"The adversaries are using the same [collaboration] techniques. They are very connected and socially aware, and there are no borders that confine them to one particular modality. They'll change tactics faster than you can change checklists."*
  > — Kurt Hakenson

  To foster sharing of critical security information among disparate industries, organizations such as the Advanced Cyber Security Center have emerged; tightly controlled access is obviously essential. Another group in Washington State links the Port of Tacoma, Amazon, and Starbucks.

  > *"If you can detect an anomaly before it turns into a threat, that's really what you want to be doing."*
  > — David Saul

  On the international stage, the stakes are even higher, yet countries struggle with sharing data across jurisdictions. The U.S., U.K., and E.U. nations enjoy fairly open lines of communication, but these can quickly begin to break down as other countries become involved.

  Formal working groups involving suppliers and governments such as TCSP.org have formed, but dealing with "federated identity environments" and liability issues is still problematic. The recent Stuxnet worm that attacked Iran's nuclear facilities exemplifies the murky nature of trans-jurisdictional security—and divergent definitions of "privacy" in the United States and China highlight how difficult agreements are. Nonetheless, multi-industry groups must work with government to help craft useful regulations.

- **A "defense-in-depth" security ecosystem starts with employee awareness and training.**

  Securing an enterprise's key data is best done through a defense-in-depth approach that employs multiple strategies. Among them:

  — *Employee awareness.* Every worker must understand how important he or she is to an enterprise's cyber security. Aside from password integrity, which is difficult to enforce, employees are on the front lines and can recognize anomalies. Cyber perpetrators often display signature behaviors; the human element is always present. It is futile to attempt to train staff to think like criminals, but they can develop a repertoire of "what-if"

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security responses. Annual refresher courses are a must because the ecosystem changes, and developers must observe best practice rules for writing secure code.

> *"Your employees are your defense against the most clever attacks, so that is our first cornerstone."*
> — Michael K. Daly

— *Data-monitoring tools.* Firewalls and other technology tools filter incoming data, but an equally important defense layer is to study outbound data traffic. Heuristic analyses show what is normal and expected, which enables flagging and investigation of abnormal data flows.

— *Avoiding single sourcing.* Companies should consider multi-sourcing from various vendors so they can route data traffic around a breach at a single supplier and still maintain the integrity of their communications.

— *Data segregation.* Internally, enterprises may decide to re-establish some degree of the data and system segregation that was abandoned or weakened during the "one-company" campaigns that took place in many organizations. Does someone in Human Resources really require access to manufacturing data? Having data in silos prevents intruders from hopping to different areas of connected systems. For similar reasons, a segmented Internet might make sense to limit virus infections.

— *Incident response.* Attacks can come from anywhere at any time, so it is critical that global companies be prepared to act within minutes in a consistent fashion.

> *"It's important to make sure that exactly the same audited processes are followed around the world."*
> — Allen Allison

— *Technology refreshes.* Companies should continually change the mix of defensive technologies in use to confuse would-be hackers.

- **Encryption is no panacea for data security.**

Although sophisticated file encryption appears to be a straightforward, well-tested solution to securing corporate data and physical assets such as hard drives, it has drawbacks:

— *Key management.* To decrypt a file or device, a software key is required. That makes key management for the life of the data essential. But keys are subject to loss or theft. In addition, weak user passwords can expose sensitive data.

— *Performance penalty.* Particularly in high-performance computing environments, decrypting files on the fly may impose an unacceptable degree of processing overhead.

— *Ease of use.* Widespread encryption can disrupt an IT department because it interferes with file sharing and workflow collaboration. Encryption also effectively disables search functionality.

— *Hackers' know-how.* Intruders are intimately familiar with popular encryption tools because they routinely use them. On-the-fly decryption requires that the key or keys be maintained in working memory, where hackers can locate and deploy them.

Despite these drawbacks, backers of encryption point to new architectural solutions that remove vulnerabilities like user passwords.

- **New technology developments may enhance cyber security.**

New technologies such as embedded chip-level security—which is likely to emerge from Intel's recent purchase of McAfee—and "Internet 2," are being built with integrated rather than "glued-on" security. These technologies provide encouraging signs that perhaps the cyber war won't last forever.

The cloud itself, although often considered an insufficiently secure environment today, may ultimately frustrate intruders, because its inherent virtualization means that data have no fixed, physical location. Nevertheless, legacy systems hold enormous troves of data that are difficult to migrate to the cloud.

The cloud may also help furnish small to medium-sized enterprises with the best security tools. Often, a small firm simply doesn't have the internal staff or financing to deploy state-of-the-art security technology, and their larger customers must either take a calculated risk in buying from them or incur the cost of sharing technologies. By shifting operations to the cloud, a small company can immediately benefit from cutting-edge security tools.

Healthcare CIO Beyond The Crossroads: Healthcare Reforms—Economy—Patient Care

- Moderator: **Sreedhar Potarazu, MD**, Founder & CEO, VitalSpring Technologies
- Speakers: **Julie C. Boughn**, Deputy Director for Operations, Center for Medicare and Medicaid Innovation, CMS
  Franklin Maddux, MD, SVP & Chief Medical Information Officer, Fresenius Medical Care – North America
  Joseph M. Pleasant, CIO & SVP, Premier
  William K. Wray, EVP & CIO, Blue Cross & Blue Shield of Rhode Island

Overview

In the current healthcare business model, few players profit economically from improved consumer health. Patients themselves don't have economic incentives to improve their health and it is usually not in a provider's economic interest to take care of patients in a more efficient way. Meanwhile, insurers and other healthcare payers absorb most of the risk. Current healthcare reform thinking says that creating accountable care organizations (ACOs) could address those shortfalls.

Most agree that both care delivery and risk sharing require restructuring of the healthcare system. In addition, the health system needs new technology solutions to support fundamental changes in data collection and distribution. Finally, market and societal pressure is increasing for consumers to take more responsibility for their health.

Context

The panelists discussed challenges in reforming the healthcare business model, including how a lack of consistent data standards keeps the healthcare system from operating efficiently. They also debated the role that consumers should play in a reformed system.

Key Takeaways

- **Healthcare needs to be transformed.**

  Most people agree that the current healthcare system is broken, but little consensus exists about how to fix it.

  > *"We've got a healthcare system that is perfectly designed to deliver the results that we get. And those results are no longer working for us as a country."*
  > — Julie C. Boughn

  The panelists shared some of their ideas:

  — Care needs to transition from an episodic model to a continuous model that is more supportive of prevention and chronic disease management.

  — Incentives need to change to support good decisions by both providers and patients.

  — Insurers must pay for care in new ways; for example, moving from a claim-by-claim approach to value-based purchasing.

  — Providers should lead a candid discussion about quality, patient safety, and cost efficiency.

  — Consumers need to shoulder more financial risk through incentives to take better care of themselves, which results in society spending less on healthcare.

- **Market solutions could lower costs.**

  As the cost of healthcare rises, pressure is increasing to restrict payments to providers. William Wray argued against that approach, saying that healthcare shouldn't be exempt from market forces. He said the answer is to allow consumers to make decisions as they do in other industries, which will force providers to compete. Competition in the market will result in lower costs. But he sees some sort of a catastrophic safety net as necessary.

  Mr. Wray offered this analogy: Imagine if people held auto insurance that included coverage for fuel. As long as the consumer doesn't feel the immediate impact of rising fuel prices, they have less incentive to seek out lower-cost fuel.

- **Defining quality is subjective and controversial.**

  The move to value-based purchasing involves establishing new standards for quality of care. But decisions about what constitutes quality are subjective. First, the science of healthcare changes frequently, making it difficult to hold providers accountable for constantly shifting best practices.

  Second, many people disagree on how to measure effectiveness. An example is a doctor spending 10 minutes advising a patient to get a flu shot. Some people want to measure the effectiveness of that consultation on an individual basis; some want to measure it at the population level. Others question whether 10 minutes is long enough. And still others wonder if the patient actually has to get the shot for the doctor to be considered successful.

  > *"If we hold doctors accountable when patients refuse flu shots, the providers should be free to say, 'You need to contribute $500 toward the cost of care if you get sick.'"*
  > — William K. Wray

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- **Data inconsistency and inoperability present big challenges.**

  An overwhelming amount of data already exists in healthcare; the problem is lack of data consistency. Joseph Pleasant said that his organization struggles with this issue. The company's analysts, who receive data from at least 1,000 hospitals each day, spend the majority of their time normalizing the information because each hospital's data is so dissimilar.

  > *"In many cases, we're taking old technology and throwing millions of dollars on top of it. We ought to be looking at a whole new way of doing this."*
  > — Joseph M. Pleasant

  Other information challenges include maintaining patient privacy and developing new metrics for analyzing population data. In addition, the tools that providers and payers use vary widely, which means that systems often can't communicate with each other. Indeed, almost everyone has a horror story about going from one care setting to another and providers not having access to vital medical information. Electronic health records were supposed to solve that problem, but implementation has not been smooth.

  Julie Boughn told this story: The IT people at the Center for Medicare and Medicaid Services once had a 45-minute "holy war" over what constitutes a provider address—whether the address is where they are incorporated, where their headquarters are located, where they provide service, or where payments are sent. If addresses cause that level of discord, imagine how difficult establishing quality measures and clinical data can be.

  Finally, today's consumers, who are used to receiving 24/7 access to all kinds of data, are demanding the same kind of open access to their healthcare information. A problem is whether they will be able to interpret it appropriately. The medical community will have to create standardized ways of presenting and interpreting data.

- **Consumers must accept more responsibility for their health.**

  In the future, people will experience pressure from the marketplace to become better healthcare consumers. For example, Dr. Franklin Maddux said that providing care at home generates a retail aspect to care that will encourage patients to act more like consumers.

  > *"Over the next decade, [Fresenius] will move from having about 8% of our patients receiving treatment at home to probably 15% or even 20%."*
  > — Dr. Franklin Maddux

  People will also experience increasing societal pressure to bear more economic consequences for their lifestyle choices. While patients probably won't be rejected from an emergency room because they are frequent McDonald's customers, Dr. Potarazu predicted that they will face some level of rationing or price increases.

- **Change will follow the money and the data.**

  The panelists offered predictions for when healthcare innovations such as ACOs will finally take hold. They agreed that implementation will happen when people get paid to make it happen. Mr. Wray noted that compared with 5–10 years ago, it is now much easier to find investors for healthcare innovation.

  Data will serve as another driver. Dr. Maddux predicted that the volume of patient-level data will reach a tipping point, creating a new breed of service providers to make sure that the right data is in the right place at the right time. Over the next 5–10 years, the industry will need to develop a novel IT infrastructure to handle those expanded data requirements.

  Ms. Boughn predicted that ACOs will begin emerging in 2012—althrough a few nascent organizations already exist.

Other Important Points

- **The cloud.** So far, healthcare has been a laggard when it comes to adopting cloud technologies, refusing thus far to use remote software and/or store data on the Internet. But Mr. Wray predicted that the business reasons for the cloud are so compelling that the healthcare industry won't be able to avoid it. And Dr. Maddux noted that the cloud could support greater standardization of many clinical care initiatives.
- **Nonprofits vs. for-profits.** The education industry has a similar mix of for-profit and nonprofit institutions. Mr. Wray pointed out that many changes happening in education are a precursor to the changes that could happen in healthcare: freedom of choice, focus on quality, setting people free to solve programs, and then expanding those models to the rest of the industry.
- **Data models.** A participant commented that in the future, multiple new data sets will co-exist: unstructured data unique to individuals, structured consumer-oriented data, and complex genomic data. Dr. Maddux agreed with that assessment and called for the industry to customize the degree of portability for each data set.

Cloud Computing Spectrum: From Low-Hanging Fruit to Game-Changing Transformation

- Moderator: **Ted Schadler**, VP & Principal Analyst, Forrester Research
- Speakers: **Ina Kamenz**, VP & CIO, Thermo Fisher Scientific
  Ali Shadman, VP & Chief Technologist, Technology Consulting, Hewlett-Packard Company
  Allen Shortnacy, Senior Cloud Architect for ISV Alliances, VMware
  Saideep Raj, North America Lead Cloud Services, Accenture

Overview

As cloud computing continues to evolve, CIOs must measure risk in new ways, rethink data governance, evaluate novel providers, and transition to new business-support roles in their organizations. Although the cloud is still too immature to handle mission-critical operations for large firms, opportunities abound for experimentation, thoughtful portfolio migration, hybrid cloud architectures, and new revenue streams.

Context

Forrester's Ted Schadler moderated this panel discussion on the cloud's current suitability to task, corporate challenges, and future impact.

Key Takeaways

- **CIOs in large companies are interested in cloud computing, but remain wary of it.**

  Still evolving, cloud computing is not yet ready to displace on-premises IT data centers. Although vendors promote the cloud as a do-anything "silver bullet," it is not. CIOs remain skeptical about:

  — *Security.* For high-risk processes, valuable intellectual property, and competitive intelligence, large companies are not willing to abandon their locked-down, in-house servers.

  — *Governance*. The lines of responsibility are still blurry when a cloud goes down, but the CIO is still responsible for reporting to his or her board.

  — *Service levels.* What degree of up time, access, and performance can cloud providers be expected to guarantee? Service-level agreements (SLAs) for cloud providers are still a work in progress.

  > *"Even though similar functionality may be available in the outside world, you may not be able to tolerate an outside cloud provider's SLA risk."*
  > — Ali Shadman

  — *Integration*. Many potential large-company efforts connect cloud resources with multiple in-house, legacy, and third-party resources. Who builds and stands behind this integration?

  — *Lock-in.* Commercial clouds are still too new for firms to know if, should the need arise, they will be able to get their data completely out of a vendor's environment.

- **Nevertheless, cloud computing offers significant opportunities right now.**

  Although no large enterprise is willing to move its core data operations to the cloud, opportunities abound for experiments, product enhancements, storage, and cloud-based messaging. Most companies are gingerly trying out various combinations of public and private cloud implementations for:

  — *"Dev and test."* With abundant virtualized resources available in one place, the cloud is an ideal staging ground for rapid and multiple iterations of new code and processes, which can be scaled up and back down without impinging on daily IT operations.

  — *Product-specific capabilities.* Thermo Fisher Scientific's LIMS (Laboratory Information Management System) continuously gathers data from lab equipment with embedded computers. By moving this data to a private cloud, both the experimenter and Thermo Fisher's support team enjoy real-time status reports and alerts.

  — *A portfolio of new opportunities.* A telephone company is exploring becoming a cloud provider, both to leverage existing investments in billing systems and to speed online provisioning, which could be a competitive advantage and create new revenue. A portfolio approach cherry picks new markets and new businesses where speed is a differentiator.

  — *Selective virtualization.* Companies can distinguish between critical and good-enough availability. One tech company kept its telephony in-house but moved its messaging to the cloud, resulting in lowered operating expense. In some firms, HR data might be ready to move to the cloud, while other data must wait for a higher level of security.

  > *"The ability to automate through virtualization puts a new API in the hands of the application and data center architects."*
  > — Allen Shortnacy

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— *"CLAs."* One panelist referred to these non-strategic "Crappy Little Apps" that every company has, but would love to clear out of the data center.

— *Burst storage and processing.* The cloud can handle temporary surges in usage without requiring additional capital expenditures.

Particularly for SMBs (small and medium-sized companies), the risk-vs.-reward tradeoff of the cloud is worth it today. Cloud providers can offer virtual data centers for a small fraction of the investment required for private infrastructure. As long as SMBs deal with cloud providers prudently, establishing control metrics and negotiating solid SLAs, SMBs can react quickly to changing market opportunities by leveraging the cloud as it stands.

> *"The world in many ways gets more convoluted, more interconnected. There's more reliance on the suppliers. So picking the suppliers feels ever-more important to me, because you're betting on their road map."*
> — Ted Schadler

- **Companies see prospects at the intersection of mobile and cloud.**

In addition to cloud computing, the other technology that has mushroomed over the past several years is mobile, with new, ever-more powerful devices appearing regularly. Together, the cloud and mobile computing represent a new way to readily store and access information.

Thermo Fisher's LIMS product has a mobile API, enabling scientists and technicians to monitor experiments from anywhere and be alerted when pre-set thresholds are crossed.

In the pharmaceutical and medical-device businesses, instant-on tablets like the Apple iPad are transforming how salespeople present research to doctors—in a comfortable way that the laptop never achieved.

Cloud storage and access availability has already changed how consumers file and retrieve their documents, messages, and photos with Google Docs, Facebook, Flickr, and other web-based applications. Businesses are not far behind, so that users don't have to tote a laptop between the office and home.

- **The CIO's role will evolve as the cloud matures.**

Few CIOs ever become CEO, but that might change as the cloud shifts their contributions toward business-unit issues. In the traditional IT environment, the CIO is the keeper of operational systems; in the new cloud paradigm, he or she will increasingly be a broker of services.

> *"We're brokers, we're managers, we're connectors, we're contract writers, we're reviewers, we're risk analyzers."*
> — Ina Kamenz

To fulfill that role, CIOs will need to learn more about business-unit requirements on a case-by-case basis, as well as the specific pros and cons of different cloud implementations. What metrics make sense for a particular application? Which SLA clauses are vital? Where are points of contact and integration with legacy applications and data? As trusted advisors to the business units, the CIO and IT staff must develop new communication skills and ways of evaluating providers.

> *"It's fundamentally balancing control and risk against innovation, change, agility, and speed. Getting that balance right is crucial."*
> — Saideep Raj

CIOs can't assume that traditional processes and metrics apply in the cloud; those who launched cloud ventures 18 months ago on that basis regret it now. Moving systems to the cloud also changes the in-house division of labor, with implications for onboarding, training, and promotion.

During this evolution, system architecture remains a critical piece of the puzzle, with successful interim architectures just as important as the end state. Every firm needs an architectural roadmap to be successful.