CAPITALIZING ON CLOUD: PREPARING PEOPLE AND PROCESSES FOR IT’S ORGANIZATIONAL CHALLENGE

Cloud-enabled services are the next wave transforming how businesses capitalize on information technology, and that in turn drives the next evolution in the processes, roles, skills, and structure of IT organizations—the evolution to IT as a Service (ITaaS). Today’s CIOs must exercise extraordinary leadership to make the transition and unleash new business value.

Howard D. Elias, President and Chief Operating Officer, Information Infrastructure and Cloud Services, EMC Corporation, and Sanjay Mirchandani, Chief Information Officer and COO, Global Centers of Excellence, EMC Corporation
TECHNOLOGY DRIVING CHANGE

Each advancing wave of technological capability—and business sophistication employing information technology—changes how IT works. Many of today’s IT leaders have been through several of these waves: PC and end-user computing, off-the-shelf enterprise systems, the Internet and eBusiness, Web 2.0, mobile devices, and anytime/anywhere computing. Another wave is cresting today as businesses and their IT organizations seek the advantages of cloud-based services.

What makes cloud computing and ITaaS so transformative?

- **Inputs**—More services are available and sourced externally, and IT has to compete for the business’s business. IT needs an outside-in focus and the collaborative skills to maintain it.
- **Processes**—The transition to business services affects the entire IT value proposition and operating model, including the skills of the IT staff and the very nature of IT solutions.
- **Outputs**—This isn’t just a change in how IT provides services, but in how the business consumes them. The business and IT have to adjust roles and expectations together.

What’s really different is the scope of change. This is the first time all three of these variables—IT’s inputs, processes, and outputs—have changed so dramatically at the same time. All of IT seems in flux: from converged and automated infrastructure, to agile applications development methods, to anytime/anywhere mobile access, to the challenges and opportunities of big data, to the consumerization of computing devices and employee expectations. ITaaS is the framework for putting the IT pieces together in more agile, productive, and valuable ways.

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<th>Traditional IT</th>
<th>IT as a Service</th>
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<td>Support the business</td>
<td>Engage the business</td>
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<td>Constrain supply</td>
<td>Stimulate demand</td>
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<td>Deliver applications</td>
<td>Aggregate services</td>
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<td>Protect the perimeter</td>
<td>Protect intellectual property</td>
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<td>Infrastructure for stability</td>
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<td>Cost center</td>
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<td>CIO shapes technology supply</td>
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CLOUD SKILLS NEEDED

In recent months, more and more businesses have come to recognize the benefits of cloud computing and service orientation—not only in cost, but in scalability and agility. In a recent cloud adoption survey, 75 percent of CIOs cited business agility as a driver of their cloud initiatives, while 56 percent cited lowering infrastructure investment\(^1\). Cloud provides a better platform for business innovation and growth—a good fit for business ambitions today. IT cannot afford to wait to catch this wave. With public cloud services setting the pace, speed of provisioning and ease of consuming information and technology services are fast becoming table stakes. Delay is a disservice to the business.

ITaaS is the culmination of a progression that has been underway for a decade. The steps have been called shared services, service-oriented architecture, self-service applications, and business process outsourcing. Progressive IT organizations have been moving toward a services model, but in fits and starts, and with too much manual effort to pull the pieces together.
Cloud Basics

Cloud creates a robust and agile platform for configuring and managing IT resources of all kinds, from servers and storage, to information and applications, to productivity tools and user interfaces. These technology assets are well-defined, modular, and connectable. Interface methods are standardized and published. Virtualization uncouples assets from physical infrastructure, enabling devices to be efficiently and securely shared, and heterogeneous technologies to work together. All of these resources can be consumed as an efficient and flexible pool, shared across the business, its customers, and its partners.

Importantly, these resources are also consumed differently as business services that people can access on-demand via self-service, usually through a standard browser interface. Businesses enjoy more transparency into the services they consume, and can often pay according to actual usage.

The Cloud approach maximizes an enterprise's technology investments by enabling better performance on multiple fronts simultaneously: cost, manageability, information integration and access, technology and service deployment, business continuity and security, business collaboration, and innovation.

There are two basic types of cloud and two common variations:

• Public: Resources are owned and managed by the provider and shared across customers. Economies of scale can be high and costs low, but for the customer, both transparency and control can also be low.
• Private: Resources are owned and managed by the enterprise and shared. The enterprise has economies of scale, cost and flexibility advantages, and transparency and control.
• Hybrid: A federation of public and private clouds, sometimes with the public cloud serving as an on-demand extension of a private cloud.
• Community: A multi-company, members-only version of a public or private cloud.

Cloud changes the game. We now have the degree of modularity and integration needed for fast and flexible configuration and sourcing of services. We now have the automated tools for deploying, consuming, charging for, and managing services. We now have a platform for implementing IaaS and realizing the business promise of optimizing on three fronts simultaneously—efficiency, agility, and service.

What corporations don’t have yet are the skills, organizational structure, and processes to realize this promise. Technology always advances faster than the ability of businesses to adopt it and use it in new ways. That’s happened with every major wave of information technology over the last fifty years. Gating factors include the skills to adopt new technologies, the imagination to put them to innovative use, and the motivation and capacity to change. Businesses that get through those gates earliest rewrite the rules of performance.

TOWARD A NEW IT ORGANIZATION

Tomorrow’s IT organization—an IaaS organization—will spend a lot less time building and maintaining technology assets and a lot more time orchestrating services and enabling the business to consume them effectively in its operations, decisions, and innovations. The work of IT will center on six processes:

• Services management—designing and configuring services from the “outside in,” based on how the business can best consume them. IT develops service catalogs, defines service levels, enables self-service, and manages the operational and financial performance of services, their security and compliance, and their improvement.
• Provider management—sourcing outside services and forging mutually productive relationships with key vendors who are ready to work on new terms. Even though there’s a large and growing array of services from which to choose, for major services, companies will likely want to partner with a select group of vendors for purposes of coherence and continuity.
• Information management—focusing on business decisions and the information and analytics for making them, including generating new information, incorporating third-party information, and making information more real time. We’ve been talking for years about putting more “I” in “CIO.” With much of the traditional technology management and applications development and maintenance activity off IT’s plate, now is the time to concentrate on bringing information to life and putting it to work.
• Architecture—designing and maintaining the coherence, flexibility, security, and business continuity of the information technology platform. With a platform that is assembled and reconfigurable rather than purpose-built and static, architecture is more than ever a focal point, a make-or-break business capability.
• Business innovation—configuring information and technology assets and developing applications rapidly in new ways to help the business experiment, learn, prototype, implement, and scale up change. If architecture holds things together, innovation stirs them up, and a business and its IT organization need to excel at both.
• Business enablement—helping business people and organizations be smart consumers of IT services, take responsibility for the information and technology assets they use, and be both productive and imaginative in putting them to use. This is an on-the-ground, across-the-business activity, and it calls for IT to operate more through guidelines and influence and less through direct controls over business activity.

A seventh process provides the necessary foundation. Robust IT governance enables the migration to cloud-based services to proceed purposefully, enables IT to do its new work with excellence, and allows the business to maximize the value of its information and technology assets. Business and IT leaders must together set direction and oversee the progress to IaaS, making responsibilities and decision rights clear, and ensuring commitment across the enterprise.
The "waterfall" approach to project execution

Vendor relations must be adjusted in order to institutional and with customers and partner brokering business services both within the future for IT, centered on provisioning and

The firm’s IT leaders see a more market-facing structure of forward-looking technical skills, the institution took the initiative in getting ahead of the curve on knowledge and experience needed now and in the future.

Some key lessons learned along the way:

- Service design is about a lot more than functionality. Key variables include availability, capacity, scalability, service levels, pricing, security, and business continuity.
- New approaches are needed for allocating funds for infrastructure transformation, as well as charging back for business services.
- Vendor relations must be adjusted in order to implement dynamic contracts and pricing.
- The "waterfall" approach to project execution doesn’t work for services development. That calls for cross-functional, high-skills, "scrum" style projects.

The firm’s IT leaders see a more market-facing future for IT, centered on provisioning and brokering business services both within the institution and with customers and partner institutions through community clouds.

IMPLICATIONS: ROLES AND SKILLS

The move to ITaaS holds profound implications for IT roles and skills. Some roles, like service owner and cloud architect, may be new. Others, like business advisor and provider manager, expand and take on more central importance. However, the big theme here— affecting most IT staff—is that skills and experience must broaden and become more cross-functional, spanning more technologies, more service components, more sources and uses of information, and more parts of the business. In addition, as roles become more cross-functional, stronger core personal skills are increasingly necessary. The IT staff must communicate, collaborate, and network—inside the company and out—to bring the best expertise into play. They also need the business acumen and confidence to participate in conversations about business services and their consumption.

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<tr>
<th>Emerging Role</th>
<th>Responsibilities</th>
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<tr>
<td>Cloud Architect</td>
<td>Bridge the technology domains, ensure the coherence of the computing environment, and manage the evolution of the cloud platform for end-to-end business services</td>
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<tr>
<td>Automation Engineer</td>
<td>Provide cross-technology integration, automated resource management, self-service provisioning, and transparency of usage in the cloud environment</td>
</tr>
<tr>
<td>Cloud Administrator</td>
<td>Manage the configuration, operation, and performance of cloud environments for specific business purposes and services</td>
</tr>
<tr>
<td>Service Manager</td>
<td>Manage the design, sourcing, resources, delivery, and service levels of a specific offering in the business and technology services catalog</td>
</tr>
<tr>
<td>Business Advisor</td>
<td>Enable a specific business organization and its management to meet information needs and forward performance and innovation objectives through effective consumption of cloud-based services</td>
</tr>
<tr>
<td>Provider Manager</td>
<td>Manage relationships with outside vendors of business and technology services and incorporate them as needed into the services management and delivery process</td>
</tr>
<tr>
<td>Financial Manager</td>
<td>Manage the finances of services sourcing, the cost transparency and consumption-based billing of services delivery, and the operating and investment budgets of the cloud platform</td>
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This skills transition will likely happen first in those building and operating the cloud platform—architects and the staff providing infrastructure services and eventually Infrastructure as a Service. As resources are virtualized, and their management is integrated and automated in a private cloud, IT must develop unprecedented technical breadth in working across traditional technology stacks, integrate helpdesk and support services, and introduce a layer of service management. From architects to service managers to support staff, IT needs more generalists even as it maintains its technological depth.

IT has often relied largely on employees’ professional commitment to keep their skills up-to-date. Today, with roles, career paths, and skills needs all in flux, IT leaders must be much more purposeful in developing and sourcing new skills. They must focus not only on new skills for emerging roles, but also on key skills such as virtualization where short supply hinders progress.

IMPLICATIONS: ORGANIZATIONAL STRUCTURE

EMC’s® IT organization is itself undergoing this transition to ITaaS roles and skills, and that’s reflected in its changing structure. The organization provides infrastructure services and support to 48,000 employees in over 80 countries and in 20 languages. Applications and infrastructure also touch over 400,000 customers and partners. The infrastructure includes 5 data centers, with over 86 percent of servers virtualized, and over 10PB of storage.

Compare the two diagrams to trace the organizational evolution. In 2008, EMC IT had the five conventional silos of architecture and technical expertise, and had achieved 20 percent
virtualization. There was communication and coordination among them, but only the front-line service desk spanned them. The main objective was to keep technology available and operational, and projects focused on delivery of customized technology components.

### Traditional Siloed IT Infrastructure Organization - 2008

In 2012, systems and storage are integrated under a private cloud architecture and the move is on to Infrastructure as a Service. A converged and cross-functional team staffs the global command center for IT service operations across all of the technology domains. A service management team focuses on the definition, delivery, finances, and marketing of business services. Other cross-functional teams focus on further virtualization and the automation of infrastructure management and service delivery. The organization’s main objective has shifted toward ensuring desired business outcomes, and project work is all about building and provisioning services.

### Cloud Enabled IT as a Service - 2012

Along the way, EMC has learned that depth in traditional roles and technologies is still essential, but so is increasing breadth. Many members of the staff had some cross-domain skills; for example, over 60 percent had skills in both operating systems and storage. However, only 20 percent had skills and experience across all of the major domains. Some people at first found the role and organizational changes a threat to their careers, so IT leadership took three key actions to prepare people for change:

- Talking openly about cloud as a sea-change for IT that opens up huge opportunities for the business and its IT professionals alike.
- Fostering collaboration to bridge the silos, including co-locating staff in a new facility to facilitate on-the-job training.
- Creating incentives to be multi-skilled, backed by extensive training and certifications for new job families and tracks, including cloud architect (resources are also available to EMC’s customers).
EMC’s IT leaders tapped into employees’ experience, potential, and desire to learn and grow. Resistance gave way to enthusiasm, and the IT staff is now pushing the skills development agenda. Also in the process, EMC has driven infrastructure utilization up and cost down—to the tune of over $100M in data center costs.

**IMPLICATIONS: WORKFORCE PLANNING**

The infrastructure services organization may see extensive change first, but IT leaders should be anticipating changes in skills needs and talent supply across the IT organization.

These are challenging times for workforce planning to begin with. As businesses emerge from a recession, technical staff are available, but are their skills current? A demographic shift is under way as the Baby Boom generation retires and young employees bring extensive (but typically incomplete) technological aptitude to the workplace. However, the most talented gravitate toward vendors rather than corporate IT. In addition, after waves of restructuring and layoffs, then a recession, many skilled staff are independent or work for services firms—available for rent but not hire.

With all that as backdrop, the organization that is also undergoing roles and skills transitions has to be more anticipatory and precise in managing talent supply to meet business demand. It’s not a matter of filling familiar requisitions for new staff, but rather of sourcing and developing staff and skills to meet evolving needs. More than ever, talent supply is in motion.

The diagram suggests how to get a handle on talent supply and manage it across three horizons: current resources for current work, development of resources for work in the pipeline, and innovation in talent and its management to realize longer term business opportunities, including the agility to keep options open and seize on the most promising.

For IT, most of the roles and skills we’ve discussed—or at least initial versions of them — address work in the pipeline as IT makes the transition to cloud-based business services and ITaaS. On-the-job experience, formal training, and new certifications for the new roles can be defined, and development planning and delivery should be in high gear.

What are some of the longer term opportunities to be anticipating? They may have to do with how the business itself can deploy cloud-based services to its customers and partners in the marketplace. In addition, they may have to do with new services that IT can perform for the business. For example, if IT becomes the de facto center of expertise in managing services and sourcing outside services, it may advise on, or manage, non-technology business services. The role of business service strategist enabling the business to consume services efficiently and effectively—may grow out of IT.
Sourcing Strategy

The move to cloud-based services reopens the basic questions about where to source capabilities and how to work with outside providers.

What does a business and its IT organization choose to do in-house? It’s no longer a question of whether to outsource major functions in their entirety. There is also no longer a sharp delineation between commodity functions to be sourced externally and business-critical and differentiating ones to be developed in-house. With a wide variety of discrete services available, IT can be much more selective, modular, and flexible in what it sources externally, how it blends inside and outside capabilities, and how it incorporates outside services into business innovations.

Vendors play a much more direct role in service delivery and business operations. When a business process is sourced as an external service, the customer company relies extensively on the vendor’s human as well as technological capability. That requires transparency into the vendor’s operations and attentive, cooperative management of service performance.

As a company takes advantage of the marketplace for innovative services, the number of vendor relationships and the importance of relationship management will grow. The importance of architecture, standards, security, and business continuity will grow as well as the company management will grow. The importance of relationships and the importance of relationship for innovative services, the number of vendor’s operations and attentive, cooperative management of service performance.

Engaging and retaining—Times of organizational change call for heightened attention to employee engagement. This is both to tap the energies and make a positive example of those who want to make change happen, and to spot early those who are disengaging because they feel that unwanted change is happening to them. In both cases, the success factors start with open communication about the what, why, and how of the organizational changes, plus incorporating people in discussing, designing, and implementing change.

Exiting—Average tenures are shorter. By developing staff you make them more marketable. People you’d much like to keep choose to depart. They should seamlessly move into your company’s “alumni network,” whereby you keep in touch, use them for referrals, perhaps engage them as contractors, and keep open the option to rejoin—with the benefit of added experience gained outside.

IMPLICATIONS: EMPLOYEE LIFE CYCLE

When roles and skills are in transition, there are implications throughout the life cycle of employment. Here is just a sample of the major ones. Use this list as a quick check on your organization’s employee management practices.

- Sourcing—What’s your strategy for getting new skills and skills combinations into the organization? For any key skill set, to what extent can you recruit to hire, network to rent, and rent to hire? You may need to be imaginative in where to look and what experience to value. In addition, with employment tenures declining, you need to be fast and effective in onboarding new staff, both permanent and temporary.
- Developing—If you can source new and broader skills outside, great, but that’s usually a partial solution at best, and a less secure source of talent than developing employees. If career paths are less clear these days (and if yesterday’s career paths haven’t aimed at tomorrow’s skills), then focus development plans on skills themselves, on what experience and abilities will be valuable to the company and the employee. Offer a focused curriculum and incentives to partake in it.
- Deploying—If 80 to 90 percent of development happens on the job, and you need broader skills, then you must have a robust program for cross-functional teamwork and for rotating staff among roles, both within IT and back-and-forth in other business roles. Every deployment decision made by a manager and employee must explicitly consider both the operational side—what the employee brings to the job—and the developmental side—what the job brings to the employee in terms of new experience, skills development, personal progress, and engagement and retention.
- Managing performance—If staff are working more cross-functionally, working for more people and projects, and making more direct business contribution through services, then performance measurement and reward systems have to incorporate those contributions. Recognize people for work outside their home functions and, of course, for adopting and accomplishing aggressive skills development plans.
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IMPLICATIONS: IT MANAGEMENT

How is the IT leadership team likely to evolve? The responsibilities of the CIO’s direct reports may align with the six major processes we outlined earlier—services management, provider management, information management, architecture, business innovation, and business enablement. A seventh role, increasingly common in IT these days, is the administrative officer, responsible for finances, human resources, and the other “business” of IT.

Because discrete services can be many, and some services consume others, it makes sense to divide services management into the natural and proven stack: overall management and methods, Infrastructure as a Service, Platform as a Service (including, for example, virtual desktop, mobile device, and information delivery platforms), and Software as a Service.

All of these IT leadership roles are business and business-customer facing. Even the most technical need to be attuned to how the business needs to integrate, how it aspires to innovate and scale up, and how it can best consume and deploy cloud-based services. Some of these roles—services management, provider management, and business innovation—may
best be filled with leaders from other parts of the business (or even other kinds of businesses) if IT lacks the bench strength.

And what about the CIO? The movement to cloud-based services accelerates the CIO’s transition from technology manager to business strategist and innovator, as well as “general contractor” of business services. As a member of the executive team, the CIO needs a great deal of business background and may well take on additional business responsibilities. We see more CIOs also leading technology-intensive functions such as banking operations or shared services organizations that encompass far more than technology services.

**IMPLICATIONS: WORKING RELATIONSHIPS**

As we said up front, cloud computing doesn’t just change how IT provides services, but also how the business consumes them. That entails adjusting expectations, communications, and working relationships. Everyone must lose the old view of IT as a “support” organization—working to specs, doing as it’s told—and view IT as a “services” organization, providing flexible capabilities and adding new forms of value.

Business people must take more direct responsibility for how they consume technology services, for exercising their powers of self-service, and for the information and devices in their control. They may need to hone their basic information management and technology skills in the process. Business units must also get over the assumption that they “own” dedicated technology resources, while IT must come to terms with having to compete and market its capabilities to be the provider of choice for many business services.

ItaaS accelerates some much-discussed trends in the evolution of IT. In addition to responding to business needs, IT anticipates them with flexible services. Instead of being merely aligned with the business, IT is more embedded in it through the processes of service consumption, information provisioning, business innovation, and business enablement. The business-IT conversation no longer centers on application specs and technology availability, but on business decisions, processes, and performance levels.

Business enablement begins with the CIO and IT leadership team encouraging their business colleagues to embrace the services model and to measure the performance and value of IT differently. Then the Business Advisors are on point, day-to-day, enabling the transitions and building new kinds of working relationships. IT’s responsibility is not just to provision services on an integrated and flexible platform, but also to educate and enable business people and organizations to be smart consumers of those services. IT and the business should also make cloud migration an opportunity to reengineer the processes of business decision-making and technology-based innovation.

**TRANSITION TIME**

Your organization is ahead of the game if it has experience with shared services, service-oriented architecture, self-service applications, and external sourcing. Even more so if IT has made progress in consolidation and virtualization of technology assets, has implemented reliable and transparent chargeback methods, and has excellence in data management and governance. Yet, even with those enablers and experience at work, some challenging transition issues arise.

- **Multiple platforms**—While migrating to a cloud-based platform for provisioning business services, IT must manage across multiple environments. The non-virtualized legacy environment of enterprise systems and other customized business applications is not going away. For the foreseeable future, IT must leverage three platforms: public cloud services with their special considerations around business continuity, secure data movement, and intellectual property protection; private cloud where the bulk of business-specific applications and services, including the most sensitive and differentiating ones, are provisioned; and the legacy environment, including the gradual modularization, virtualization, and repackaging of selected applications as services.
• **IT finances**—The pricing and funding of IT may be in for an overhaul. Many services are pay-by-use. IT needs cost transparency, consumption-based billing, and the flexibility for strategic pricing to stimulate demand and steer consumers to cost-effective service options. In the meantime, the business must take the long view in planning for and investing in services and their platform; year-at-a-time, project-based, and +/-5 percent funding won’t accomplish the transition. Legacy and cloud environments need separate funding methods.

• **Workload analysis**—A fundamental and pragmatic question is: what applications and other “workloads” (e.g., email and collaborative workspaces) would be good candidates to source or package as services and move to the cloud—and to which type of cloud? We recommend evaluating candidate workloads through three “filters”:
  — **Functional**—will cloud-based delivery maintain or enhance capability and performance and increase agility?
  — **Economic**—will cloud-based delivery lower costs or shift expenditure from capital investment to operating expense?
  — **Trust**—will cloud-based delivery maintain or (in a private cloud) enhance business continuity and the protection of sensitive and necessarily secure data and other assets?

• **Transition skills**—If no individuals have all the skills and experience for new roles such as cross-domain cloud architect, then it makes sense to fill them with pairs of people or small cross-functional teams. That may apply even to roles such as services management on the IT leadership team. There may also be additional roles during the transition—for education, organizational change, risk management, and perhaps the marketing campaign—to encourage business people to embrace the services model.

The transition to ITaaS is a journey, not a project. The changes won’t be made all at once, but most can be made rather quickly—in 18 to 24 months—with business benefits quickly accruing along the way. Rapid success depends upon realistic anticipation of the challenges, a coherent and flexible roadmap, and partners with the experience and supplemental skills that IT needs.

What does it take to move forward in terms of people, process, and technology? A roadmap puts the new pieces in place—from technology and automation, to process changes, to new roles and staff training, to the migration of specific workloads to their cloud destinations—under the guidance of a clear governance structure.

A successful journey is really about anticipation, and your roadmap documents what you anticipate: steps to take; their sequence and interdependencies; stakeholders and how to incorporate them; likely obstacles and how to remove them; and the pragmatics of staffing, funding, timetables, and milestones. A coherent roadmap avoids fragmented activities, while it accelerates and maximizes the cost, performance, and flexibility benefits. The journey will be challenging, but well worth the effort. With a good roadmap, you can proceed with confidence.

**THE CONTINUING EVOLUTION OF IT**

With each wave of technological advances, some have predicted obsolescence for the IT organization: “The business will be doing everything for itself. IT will shrink and disappear.” In fact, the roles and challenges of enabling enterprises to capitalize on information technology aren’t evaporating—they’re just changing yet again.

IT’s role may soon center on aggregating services and managing the platform, but it still adds special value through its unique knowledge of the business and its processes. As more services are sourced outside the enterprise, service consumption is managed by the business, the workforce grows more technologically competent, technology management roles consolidate, and the large company IT organization may shrink—but the remaining roles will be more challenging, versatile, and value adding.
Meanwhile new roles and new ways of creating value are emerging. For example, as the platform is automated, emphasis shifts away from managing technologies towards provisioning information and enabling its use, including the use of analytics. In addition, as businesses are impelled to innovate, the platform enables faster and more collaborative innovation—scaling up, integrating, and operationalizing successful innovations in record time. It takes a different kind of IT to play these new roles.

We said that ITaaS calls for extraordinary leadership from the CIO and IT management team. That leadership begins with making the business case for change in how the enterprise leverages technology, and in the roles and skills of the IT organization. The case is based on a clear understanding of both the economic and agility benefits of the cloud and of the continuing evolution of IT as a business service provider.

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Elias, a veteran IT executive, has overall responsibility for setting strategy and driving execution for EMC’s Information Infrastructure and Cloud Services business, including EMC Global Services, and serves on the Board of Managers of the Virtual Computing Environment (VCE) Company, formed by Cisco and EMC with investments from VMware® and Intel. He is a member of EMC’s Office of the Chairman, reporting to Joe Tucci, EMC’s Chairman, President, and CEO. Elias has been with EMC since 2003, after serving in executive leadership positions at Hewlett-Packard, Compaq, Digital Equipment Corporation, and Tandy Corporation. Elias is a director of Gannett, one of the USA’s leading media and marketing solutions companies and also serves as a director of the National Action Council for Minorities in Engineering (NACME).

Elias is a strong supporter of science, technology, engineering, and mathematics (STEM) education, whose advocacy and opinion has been published in Forbes, U.S. News & World Report and other influential publications.

Elias attended Wayne State University and Lawrence Technological University, where he studied electrical engineering and computer science.

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Industry veteran Sanjay Mirchandani leads EMC’s award-winning IT organization to further operational excellence and drive business agility to support the ever-evolving needs of the company and its more than 50,000 employees. As COO, Mirchandani also oversees the worldwide R&D, customer support, and shared service initiatives at EMC’s seven Global Centers of Excellence.

Mirchandani serves on Northeastern University’s Center for Emerging Markets advisory board and is a member of the Leadership Council for Information Advantage. He earned his master’s in business administration from the University of Pittsburgh and bachelor’s from Drew University. Mirchandani also received Drew’s Achievement in Business award and Computerworld’s Premier 100 Award.