Cloud Strategy Brief

Situational Awareness

Identifying competencies for IT value transformation

Virtualization and cloud solutions create a unique opportunity to transform IT from a cost center to a strategic value driver. However, infrastructure changes by themselves are not enough to transform the business value of technology. IT executives also need to shift focus from technology to business outcomes, and communicate more effectively with business managers.

The IT Value Transformation Road Map presents a three-stage approach to using virtualization and cloud solutions to transform IT from a cost center to a strategic value driver. The road map highlights specific competencies that should be developed in order optimize the value transformation potential of virtualization and cloud solutions.

Five areas of competencies include operational processes, datacenter automation, tools and infrastructure, skills, as well as service costing and billing. Assessing your organizations abilities in these areas can help you identify next steps that drive value transformation.

This paper and three associated strategy briefs are intended to help IT executives develop a transformation vision, determine current state, identify incremental changes, measure progress, and communicate results.

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About the Author

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About the IT Process Institute

The IT Process Institute is an independent research organization that exists to advance IT management science through independent research, benchmarking, and development of prescriptive guidance. Our vision is to identify practices that are proven to improve the performance of IT organizations. www.itpi.org

The IT Value Transformation Road Map

The IT Value Transformation Road Map is based on findings from three groundbreaking research studies[1]. Each study reveals specific incremental changes common to organizations that have successfully made the transformation from cost center to driver of business value. The road map identifies specific objectives, competencies, and metrics at both the infrastructure level and the executive communications level.

Infrastructure level changes leverage virtualization and cloud-based architectures to increase IT process efficiency and resource utilization. The resulting IT-as-a-service computing models enable IT to respond quickly to the changing needs of the business.

Executive communication level changes include increasing IT cost transparency and linking IT costs directly to business outcomes. By communicating the positive impact of IT spending on business results, IT executives can shift the focus of business executives from IT cost minimization to leveraging technology to gain competitive advantage.

Figure 1 shows the three stages of change in the IT Value Transformation Road Map. Each stage is catalytic in that it frees resources for efforts at the next stage. Each stage is ordered to address specific prerequisites. In addition, each stage is sustaining, so that new practices remain in place throughout the transformation.

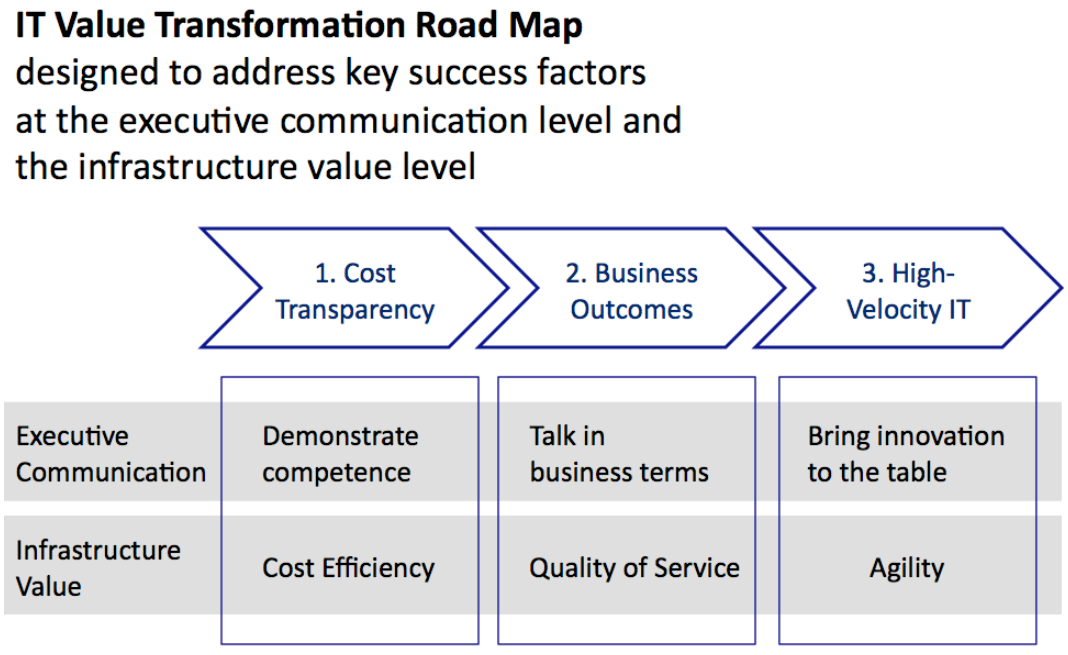

Figure 1. IT Value Transformation Road Map

Figure 2 summarizes the key elements of the road map presented in Strategy brief #1 "The IT Value Transformation Roadmap".

This strategy brief is focused on the key competencies required to enable IT value transformation.

IT Value Transformation Road Map			
	Stage 1: Cost Transparency	**Stage 2: Business Outcomes**	**Stage 3: High-Velocity IT**
Transformation Objective	• Communicate IT results in business terms • Baseline cost, quality and agility	• Link IT efforts to business outcomes • Deploy shared resource model	• Drive game-changing competitive advantage • Deploy IT-as-a-service resource model
Key Metrics	• Capital expenses • Operational expenses • Service and cost visibility	• Availability • Service support • Application release speed • Percentage of resources running what is in place	• Time to capability • Scalability • Process consistency • Resource utilization
Infrastructure Value	• Cost efficiency and transparency	• Business application quality of service	• Agility and responsiveness
Competencies	• Establish virtualization foundation • Present unit cost information • Adopt business-centric communications	• Present cost information related to business outcomes • Virtualize business-critical applications • Allocate IT resources to support business process optimization	• Present game-changing IT innovation • Deploy private and hybrid cloud solutions • Allocate IT resources to identify game-changing innovation
IT Executive Communication Challenge	• Demonstrate that IT can effectively manage resources	• Shift communications to an external business perspective	• Identify and communicate game-changing innovation
Executive Level Transformation Story	• Better resource management	• Better service levels for business-critical applications	• Improved agility and ability to say "yes" to more opportunities • Anticipate high-value opportunities

Figure 2. IT Value Transformation Road Map summary table

Evolving Competencies

Implementing the three-stage framework of the transformation road map requires building competencies at both the infrastructure and executive communication levels.

At the infrastructure level, IT must implement virtualization up and down the technology stack. This enables IT to meet service level commitments independently of hardware. First, IT must consolidate the infrastructure — virtualizing, standardizing, and automating wherever possible. After gaining high levels of consolidation, standardization, and automation, IT can move on to deploy shared-resource and IT-as-a-service computing models.

At the executive governance level, the IT organization must shift focus to exploiting the strategic uses of technology. This can be accomplished in three steps. First, IT must link IT spending to business outcomes. This requires developing a unit-based cost framework to increase the transparency of IT spending. Second, IT must shift the focus of its communication with business executives to business outcomes. IT can then move on to the third step which is to become an active participant in business strategy development by researching and proposing technology-driven innovation.

Figure 3 shows the competencies required at each of the three transformation stages. The following sections discuss, in detail, the competencies to be developed at each stage.

	1. Cost Transparency	2. Business Outcomes	3. High-Velocity IT
Operational Process	• Optimize for virtualization	• Optimize for shared-resource	• Optimize for IT-as-a-service
Automation	• Provisioning	• Core service management processes	• Full lifecycle management
Tools and Infrastructure	• Upgrade server, network, storage	• Application centric performance • Service Catalog	• Hybrid performance
Skills	• Virtualization • Business-centric communications	• Business Process Improvement	• R&D innovation • Train business on IT
Service Model, Costing, Billing	• Unit-level costing	• Allocation-based chargeback	• Usage-based chargeback

Figure 3. Competencies at each transformation stage

Competencies for Stage 1: Cost Transparency

In Stage 1, IT builds the basic competencies that provide the foundation for the subsequent stages.

At the infrastructure level, IT begins by deploying a virtualization proof of concept (POC) project that involves systems that are under its direct control. Initial efforts focus on developing virtualization-related skills, policies, and processes. IT assesses the improvements brought about by the project using cost, quality of service, and agility metrics.

At the executive level, IT establishes transparent cost mechanisms and switches to business-focused communications. These steps enable IT to demonstrate that it is effectively managing resources, improving business executives' confidence in IT. Establishing this confidence is necessary to begin to shift the executives' focus away from IT cost reduction.

Here's a detailed look at each of the competencies to be developed in Stage 1.

Optimize operational processes for virtualization

The use of virtualization impacts data-center operating procedures. As IT virtualizes systems, it must update function-specific processes that address the new capabilities enabled by virtualization.

Virtualization necessitates process and policy changes across the entire IT infrastructure and organization. For example, the ease of building and deploying virtual servers has major impact on change management and on build-versus-repair decisions. The ability to virtualize operating system (OS) and application images streamlines the management of standard builds. The ability to move workloads reduces service disruption due to planned maintenance and minimizes after-hours maintenance work. Virtualization also changes the configuration and management of networks. And, it necessitates changes in storage and backup strategies because virtual images can be stored on storage area networks (SAN) rather than on host servers.

Automate provisioning

IT-as-a-service computing models require a high degree of automation. That requires standardizing processes because it's not practical to effectively automate processes that are not standardized. An ITPI research study on the impact of key change, configuration, and release management practices on IT operating performance made an interesting discovery. It revealed that a process culture in which IT employees consistently follow standard operating procedures has a greater impact on overall IT operating performance than any other set of practices studied.[2]

You can't effectively automate a process that isn't standardized

Consequently, to prepare for automation such as automated provisioning, the IT staff should define, document, and consistently follow standardized operational practices. These practices should encompass a variety of areas, including:

- Server installation
- Provisioning (including security guidelines)
- Patch management
- Change, configuration, and release management

Upgrade server, network, storage resources

The evolution from a dedicated physical server environment to an IT-as-a-service model impacts servers, networks, and storage. To leverage the full potential of this powerful model and to optimize various functional processes, IT should consider updating its infrastructure resources.

Infrastructure upgrade. In this stage, IT virtualizes and consolidates the servers directly under its control. Here, IT should consider a hardware refresh to more powerful servers that can accommodate a higher number of Virtual Machines (VMs).[3] IT should also consider implementing a Storage Area Network (SAN) to facilitate central management of images used for backup and restoration of OS and applications. In addition, the use of faster interconnect technology should be investigated to enable rapid movement of workloads, a key requirement for the IT-as-a-service deployment model.

Asset inventory. A comprehensive inventory of physical servers, their resources, and all software assets helps IT identify which IT-controlled systems to virtualize in the POC project. The inventory also facilitates the identification of business applications to later virtualize in Stage 2. Moreover, an inventory of applications, their owners, the number of users per application, and the business purposes and criticality of these applications provide the detail needed to create a unit-level cost model.

Discovery and CMDB. A Configuration Management Database (CMDB) or similar capability is needed to track and link physical and virtual resources. Having a CMDB that records the provisioning, movement, and expansion of virtual resources is essential for meeting compliance and security requirements in the dynamic virtualized environment. Discovery tools that are physical- and virtual-aware are also needed for maintaining the accuracy of the CMDB.

Utilization measurement. Tools that measure server utilization can be deployed to analyze usage patterns. Many organizations have a large percentage of servers that average single- or low double-digit utilization. These servers are prime candidates for consolidation. Usage information combined with application license counts also helps IT build a business case that shows potential savings made possible by consolidation.

Build cross-functional virtualization skills

Many organizations deploy their initial virtualization implementations in test and development environments. The virtualization footprint often expands organically as skills and capabilities are developed. To gain maximum benefit from these deployments, it's important to manage them as formal POC projects that have the sponsorship and support of company executives.

Create a project doctrine that energizes the staff and gives all participants a sense of ownership. Be aware of vocabulary and cultural gaps between different functional groups, such as between server administrators, who have deep virtualization knowledge, and other functional managers. Don't assume that all groups understand the technology or its impact on their areas of expertise.

Some skeptics in the IT organization might need executive-level encouragement to help them understand how virtualization will improve their jobs and work processes. Storage, network, support, quality assurance, security, and IT audit teams should all be included in project launch efforts so they can provide input during critical design decisions.

Use business-centric communications

Initial virtualization deployments at this stage can be positioned as a proactive changes in IT strategy that are being implemented to drive simultaneous cost, service quality, and agility improvements.

Business executives expect IT executives to communicate in a way that demonstrates their effective management of the resources in their domain of control. A common barrier to shifting business executives' focus away from IT cost reduction is that IT executives do not communicate with them in business terms. Consequently, business executives may be doubtful that adequate IT governance mechanisms are in place to effectively manage existing IT resources. Top IT executives must not only have firm grasp of their cost and service delivery numbers, but also be able to communicate them in a way that demonstrates their effective management of IT resources.[4]

Purchasing and billing. Forward-looking organizations that deploy virtualization in shared-resource or IT-as-a-service models modify their procurement process to proactively purchase computing resources.[5] Pre-virtualization processes have typically linked system purchases to funded projects. In a virtualized, shared-resource environment, however, resources are typically purchased by IT to be placed in inventory and then allocated to projects as needed.

Implement unit-level costing

An accurate chargeback or showback scheme is necessary for improving the cost visibility of IT spending and demonstrating the direct cost benefits of virtualization. Unit-level costing gives business funders of IT a clear understanding of what drives IT costs, allowing them to

An accurate chargeback or showback scheme is critical for improving the cost visibility of IT spending.

better manage demand. Coarse-grained cost allocation methods usually are neither equitable nor defensible. A transparent costing scheme, on the other hand, convinces funders that they are being treated fairly.

In Stage 1, a costing scheme that tracks costs on a per-server basis builds a foundation for fixed-cost showback or chargeback functions. A higher level of unit tracking is the annual cost per application. The costs per sever and the annual cost per application are often equal because each application is typically associated with a single VM.

A more granular level of unit-based costing tracks the infrastructure cost per application user. Cost tracking at this level of detail requires user data to implement and may not be needed.

Competencies for Stage 2: Business Outcomes

At this stage, the virtualization- and cloud-driven transformation shifts focus to business outcomes.

At the infrastructure level, the virtualization footprint is expanded to include business-critical applications. Here, there is a shift to a high degree of standardization of operating processes and configurations. IT deploys increased automation to optimize systems management across shared computing resources. Application- and end-user-centric performance management shifts focus from servers to business-facing applications. Unit-level costing is extended to include different costs for different resource configurations.

At the executive level, IT executives develop a business case for moving applications to a shared-resource model. The executives also directly link IT spending to business outcomes and allocate freed resources to improve business process efficiency and effectiveness.

Optimize operational processes for shared-resource

In Stage 1, operating procedures were standardized and then optimized for virtualization. In this stage, procedures are further optimized for the shared-resource environment. Cloud-computing environments are highly inefficient when resources aren't shared, and shared-resource environments are highly inefficient when processes aren't standardized. Standardized processes also help IT meet compliance and security objectives in the highly dynamic shared-resource environment in which resources move across servers or from location to location.

High availability and disaster recovery. A VM image consists of a single data file that includes the OS and application. If a service interruption or a more serious disaster situation arises, an otherwise un-replicated VM can be loaded from a SAN onto another server to quickly restore the application function. As a result, servers can be rebuilt in a matter of minutes, greatly reducing the mean time to repair (MTTR). In fact, an entire data center can be moved to another location in the event of a serious

outage. Virtualization does not necessarily increase the effectiveness of high availability or disaster recovery approaches. Rather, it is a lower cost alternative that permits IT to bring more systems under the umbrella of business continuity protection.

Decommissioning servers. In this stage, IT should implement a new process — the process for decommissioning virtual servers. The provisioning process for virtual servers should include a parameter that specifies how long a provisioned virtual server will be needed. IT should establish a process for monitoring the use of virtual servers near their specified decommission time to determine if they are still needed. If so, their usage can be extended. Having this process in place to identify and retire unused virtual servers minimizes virtual-sprawl with all its attendant problems.

Automate core service management processes

In this stage, the use of automation is extended to core service management processes. Here, IT continues to build tool- and function-specific automation expertise, gaining a broad understanding of and experience in automating IT processes and workflows. This automation expertise is a prerequisite for deploying the IT-as-a-service model in Stage 3. Automation efforts should be focused on those areas in which highly skilled people execute repetitive manual tasks, manually track activity, or manually collect and record data.

Initial automation targets include:

- **Provisioning production**—Integrate virtual server request and fulfillment processes with the existing service desk.
- **Change tracking**—Trigger change verification and a record-keeping workflow from virtualization tool actions.
- **Configuration verification**—Trigger automated discovery and configuration data updates from virtualization tool actions.
- **Failover and rebuild**—Leverage tools to automate the process of rebuilding or re-provisioning systems, or recovering entire data-center sites. Regularly test and verify that the images and rebuild process produce the desired results.

Focus on application performance

Applications that run in shared-resource environments use a mix of physical and virtual resources. The supporting infrastructure may include multiple platforms and employ a variety of point tools from multiple vendors. It's important to keep in mind, however, that business funders and users of IT have an application-centric view of performance and service levels.

Consequently, IT should extend performance monitoring from infrastructure-level monitoring to also include monitoring of the overall performance of applications and workloads. Infrastructure-level monitoring provides a bottom-up view that encompasses component-level monitoring tools, software instrumentation, log files, and other vendor-supplied management tools. Application-centric monitoring provides a top-down transaction view that spans client applications, VMs, networks, servers, and databases.

Guarantee application performance. A best practice approach to gaining business funder and application owner buy-in for virtualizing business applications is to guarantee application performance. Tactics that support this approach include:

- Classify applications according to business priority and risk.
- Guarantee resources for specific applications, such as by allocating memory, CPU, and I/O resources to VMs based on priority.
- If necessary, deploy applications in a 1:1 VM to host ratio.
- Deploy a parallel test bed to benchmark application performance and compare it in the virtual and physical server environments.

Implement a service catalog

Update the service catalog to include multiple tiers of standard configurations and show costs for each tier. To simplify allocation-based chargeback, create templates for large, medium, and small server configurations that have different levels of CPU, memory, storage, and I/O.

Be sure to highlight the faster provisioning time, lower support costs, and higher service levels for standardized servers as compared to custom or physical servers. Standardized servers deliver substantial benefits. Fewer highly skilled resources are needed to build standardized servers. More processes can be automated, reducing management costs. In addition, IT can deploy and audit security and compliance at the policy level instead of the individual server level.

Apply IT resources to business process improvement

IT executives should establish both formal and informal touch points with business executives to identify opportunities for improving business processes. Virtualization-driven efficiencies free IT personnel resources that can be applied to business process improvement efforts. Senior IT managers with business skills can work with teams focused on improving key business processes. IT automation and data integration experts can help improve key value chain processes such as supply chain integration or loan processing optimization.

IT product management. IT should staff product managers. These people can perform such functions as identifying customer needs, determining the core value proposition (cost, service quality, agility) of different deployment options, modeling costs, monitoring competitors' use of technology, creating a service roadmap, and creating usage policies to meet compliance and security requirements. Product managers can also gauge customer trends using customer satisfaction surveys. In addition, product managers can help IT communicate the value of operational and support services, such as performance monitoring, that help ensure the quality of IT business service delivery.

Implement allocation-based chargeback

An allocation-based chargeback mechanism should be deployed at this stage. Unit-level costs will vary depending on the specific configuration of computing resources allocated. Adopting an allocated-cost chargeback system highlights the variations in resource consumption, service levels, and HA and DR services that create the cost differentials.

The unit cost charged back to the business varies depending on the configuration of computing resources allocated.

Linking costs to delivered services increases cost transparency and shows the relationship between IT spending and specific service levels and business outcomes. The resulting increased visibility helps business managers make better-informed decisions with respect to IT services.

Competencies for Stage 3: High-Velocity IT

At this stage, a virtualization- and cloud-driven transformation shifts focus to identifying and deploying game-changing uses of technology.

At the infrastructure level, virtualization and cloud technologies are deployed in an IT-as-a-service model. Computing resources may be located internally in resource pools, or externally at cloud service providers. Resources can be deployed temporarily and scaled or moved on demand to meet changing business needs. IT manages applications as part of a portfolio of deployment options that best fits the cost, service quality, security, compliance, and duration requirements for each application. Business units pay for resources through a hybrid model that includes usage-based chargeback.

At the executive level, IT executives have developed and demonstrated the ability to focus on business results. Here, IT resources freed as a result of efficiency gains during previous stages are deployed to help research and identify game-changing uses of technology. CIOs can now move away from an operational role, giving them more time to spend with customers, and actively help shape and execute business strategy.

Optimize operational processes for IT-as-a-service

IT-as-a-service models are inherently dynamic. Workloads may move within a cluster; move from cluster to cluster such as during maintenance or times of peak resource consumption; and move to external resource providers on a temporary or permanent basis. In any case, IT is responsible for compliance, security, and service and support for these nomadic applications. That means knowing where each application is now, and where it has been. Automation is required to track application movement, associating, at any point in time, each application instance with a specific cluster or hardware-based host.

Automate full lifecycle management

At this stage, the major portions of the resource lifecycle should be automated. That includes configuring, building, and provisioning workloads; monitoring application performance; adjusting resource levels as needed to maintain performance; and decommissioning resources after use. Automated decommissioning in a cross-environment model should factor in data storage requirements.

The automation scheme must also encompass backup and recovery. If an application runs in an external provider's environment, IT is still responsible for archiving data to meet regulatory requirements that govern the long-term storage of relevant data.

Targeting policies. It needs to develop policies that specify where applications are to be deployed. Business units might request resources for a specific purpose and duration. However, IT should determine which deployment model best fits the purpose. Compliance requirements may mandate that certain applications and data be deployed internally. Security policies may dictate that specific Web application resources can be deployed only in certain configurations. There are other factors that also influence deployment decisions. For example: Do the applications have predictable workloads? Do they have latency requirements? Are they business critical? What are the service level agreements (SLAs) for the deployments?

These factors, among others, must be considered when developing policies that dictate deployment options. The IT-as-a-service model accelerates time to capability. However, IT must still maintain responsibility for the deployment of systems that are within its scope of control.

Policies should dictate where requested resources are deployed.

Hybrid performance management

Because IT is responsible for honoring service level commitments, the IT staff needs to deploy of cross-environment monitoring and service management tools. This deployment should build on the application-centric performance and capacity monitoring tools deployed at stage 2.

Self-service portal. IT organizations should deploy a self-service mechanism to facilitate easy access to IT services and computing resources. This mechanism leverages the catalog of IT services created in Step 2. The catalog should display the cost of each option, such as ordering a laptop computer. The service requestor should be required to enter information about the intended use of the resource (Is it in scope for regulatory and security requirements?) as well as the duration of deployment.

The self-service portal should be integrated with the targeting policy engine and the automated provisioning mechanism. Integrating the portal with the change management system facilitates automated tracking. In a self-service environment, some organizations require spending authorization. This can be implemented using either a purchase order lookup mechanism or a workflow-based approval routing.

Fund R&D innovation

The primary objective for IT value transformation is to elevate the perceived role of IT to that of strategic enabler. IT resources freed as a result of operational efficiencies gained in Stage 1 and Stage 2 should be applied, in part, to researching and identifying game-changing innovation. IT should benchmark competitors (other captive IT organizations, third-party providers, and external cloud service providers). At this point, the CIO should have earned the right to participate in business strategy activities. Consequently, he or she must allocate resources to fomenting ideas for technology-driven innovation.

Train business on IT capabilities

IT should proactively educate business managers on how it can help drive strategic value. Research from CogniTech Services suggests that business executives typically focus on pressuring IT to cut costs and do not look to IT for help with revenue-focused initiatives. This research also reveals that business executives are often not aware of the revenue-focused capabilities of IT and may not know how to query IT to find out.[6] If IT executives don't communicate the business opportunities opened up by new virtualization and cloud capabilities, the focus of business executives will remain on IT cost reduction.

Use-based chargeback

IT should deploy a hybrid cost model that accommodates three types of costs: fixed, allocation-based, and usage-based. Different services, therefore, will have different cost makeup. The billing scheme should take this variation into account and provide chargeback with complete transparency so business funders can make accurate cost-benefit assessments.

Service cost model. One of the compelling benefits of the IT-as-a-service model is that business units do not incur capital expenses, so they can bill IT resources solely as operating expenses. However, IT must still purchase capital equipment to build the shared-resource infrastructure that provides services to the business units. Therefore, to appropriately price usage-based services, IT needs to take capital expenses into account when determining costs and creating cost allocation models.

Moving business applications into a virtualized, shared-resource environment in stage 2 lowers the unit cost of server resources. As a result, as IT adopts the IT-as-a-service model in Stage 3, business funders and application owners are likely to expect further cost reductions.

To properly manage supply versus demand, IT needs to assess the cost implications of moving each application to the IT-as-a-service environment. First of all, it may be unnecessary to move all applications. In some cases, it may be less costly to procure a service externally than to provide it internally. IT needs to take all these factors into consideration when making decisions and determining costs of different resource options.

Summary

Forward-looking IT executives realize the power of IT to deliver strategic value to the business. In many organizations, however, business executives tend to perceive IT more as a cost center than as a contributor to business value. This paper is one of series that present a three-stage roadmap for transforming IT from a cost center to a strategic value driver and communicating that transformation to business executives.

The paper focuses on the competencies that IT must develop throughout each of the three phases in order to make the transition successfully. Building these competencies in stages and across multiple domains helps IT successfully navigate the evolutionary changes that build not only IT's confidence in technology but also build business executives' confidence in IT.

Endnotes

[1] Key findings from three multiple primary research studies suggests a common pattern of activity at firms where IT executives have led the transformation of IT from cost center to strategic value driver.

> Richard Hunter and George Westerman, *The Real Business of IT: How CIOs Create and Communicate Value* (Boston, MA: Harvard Business Press, 2009), xvi. This book highlights findings from a wide range of studies conducted by Gartner and MIT, including extensive interviews, surveys, and roundtables. "The path to success for these CIOs is not only clear, but astonishingly common—not in the sense of ordinary but in the sense that it is shared."
>
> Kurt Milne, "Strategic Alignment Performance Study," IT Process Institute, September 2008. This ITPI study of 269 IT organizations identified specific practices that optimize IT business integration that differ based on the organization's overall value delivered to the business.
>
> Vittorio Viarengo, "Virtualization Journey Stages," *Virtualization Journey*, www.journeytocloud.com. This study based on detailed interviews of IT executives at over 50 VMware customers found a common pattern of adoption of how organizations implement and expand their use of VMware products.

[2] Kurt Milne, "Change configuration and release performance study," IT Process Institute, October 2007. This study identified 9 groups of practices that had a statistically significant impact on overall operational performance. The process culture related practices had the highest impact on overall performance, predicting almost 45% of performance variation across 349 IT organizations studied.

[3] Kurt Milne, "Server virtualization maturity study," IT Process Institute, 2009. Roughly 50% of production servers were virtualized in conjunction with a hardware update effort.

[4] Richard Hunter and George Westerman, *The Real Business of IT: How CIOs Create and Communicate Value* (Boston, MA: Harvard Business Press, 2009), 43. "Top performers always know what their numbers are. To be perceived as a top performer, IT must know the score and communicate it to the rest of the business—just as the head of sales knows and communicates the sales figures for the latest quarter."

[5] Ibid. 66% of organizations pursuing dynamic resource management objectives have modified procurement processes to pre-purchase hardware, where hardware purchases were previously tied to a funded project. Only 36% of organizations focused on server consolidation have modified procurement processes.

[6] The CIO as an Engineer of Revenue. Kay Lewis Redditt, Thomas M. Lodahl. CIO insight. No 112, 2nd quarter 2010. P27.