A Forrester Consulting Thought Leadership Paper Commissioned By TeamQuest

The Key To Cloud And Virtual Computing

Managing And Planning Capacity In 2011 And Beyond

June 2011

FORRESTER

Headquarters | Forrester Research, Inc.
400 Technology Square, Cambridge, MA 02139 USA
Tel: +1 617.613.6000 | Fax: +1 617.613.5000 | www.forrester.com

Table Of Contents

About Forrester Consulting
Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit www.forrester.com/consulting.

Executive Summary

The flexibility and cost alternatives provided by new technologies — such as virtualization, internal and external cloud computing, and different types of cloud-based solutions such as software-as-a-service (SaaS) — present IT organizations with a choice of platforms to run an application or a business service. As IT efficiency remains a top priority for IT, cloud and virtualization appear as the magic bullet that will both resolve capex and opex issues while still providing the right service quality. The reality is that while these computing models may provide enabling technologies in the pursuit of efficiency, they only epitomize the need for a better and more reliable capacity management process that would help take full advantage of these computing models. These models offer the means to orchestrate the allocation of resources and the location of applications, but they do not provide the fundamental decision support that these choices require: They provide the "how" without providing the "why." This is where capacity and performance management enter the picture: They are the tools that indicate whether more resources are needed to maintain service levels as well as forecast the infrastructure changes that will satisfy future business requirements. By creating infrastructure models, capacity management also provides a foundation by which the costs of different choices may be evaluated: Managing and planning capacity is no longer a process aimed at forecasting hardware needs; it is the key to understanding and optimizing the cost of running business services through platform optimization.

Key Findings

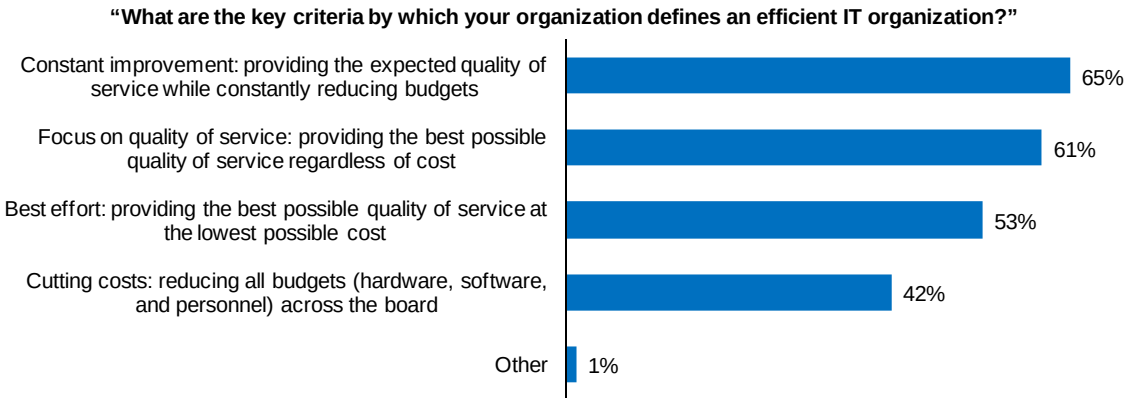
Forrester's study yielded three key findings:

- CIOs are being asked not only to do more with less but also to do it with lower headcount while delivering higher IT service levels. By wringing out more performance without adding huge IT infrastructure line items to the budget, virtualization and cloud computing seem to provide the more-bang-for-less-buck solution that IT organizations are looking for.
- But these new computing models come with their own issues of selecting the right platform and maintaining the service levels expected by business users.
- As these new computing models become more widespread, more sophisticated tools are needed. Managing capacity not only provides the ability to monitor performance and quality of service; it also supplies a template to evaluate the costs of different solutions and a guide to selecting the optimal one.

The Pursuit Of IT Efficiency

Constantly reducing budgets while maintaining the expected quality of service is the definition of efficient IT according to close to two-thirds of respondents to a March 2011 Forrester survey (see Figure 1).

Figure 1
Key Criteria By Which Organizations Define IT Efficiency

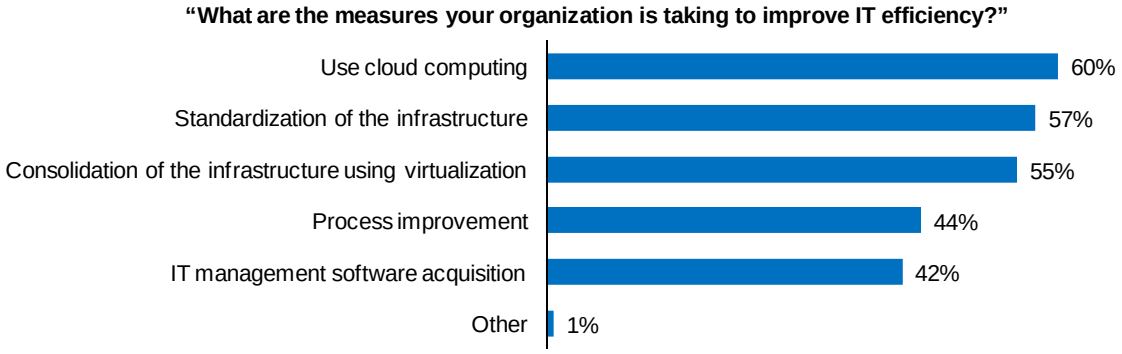


Base: 230 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

A vast majority of these IT organizations believe that this efficiency objective can be achieved with new computing models and by a focus on hardware standardization. Clearly, the overwhelming trend is to take full advantage of computing platform choices that are currently offered: commodity hardware, virtualization, and cloud computing. These computing models are seen rightly as a way to reduce capital investments but also operational costs through infrastructure rationalization (see Figure 2).

Figure 2
Cloud And Virtualization Computing Seen As Efficiency Accelerants



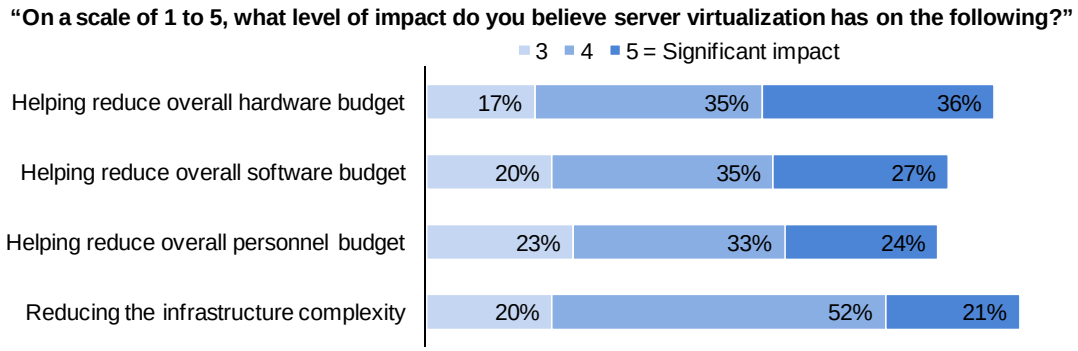
Base: 230 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

These expectations are confirmed by our next question, which confirms that (see Figure 3):

- **A strong majority expects to reduce infrastructure complexity.** Complexity of infrastructure — born from increased volumes of business services, multiple dependencies between applications supporting business services, and especially the presence of a diversity of legacy platforms — is one of the key factors in increased costs due to the multiplicity of management tools, the difficulty of finding the root cause of performance issues, and the necessity to train skilled specialists on diverse computing platforms.
- **The most important motivation is still to reduce the hardware budget.** Although this is no longer the most important expenditure of IT operations, there is an expectation that virtualization will ease server consolidation and lead to better price/performance solutions.
- **Software and personnel budget reduction is an expected consequence.** Server consolidation, but especially cloud services such as SaaS, is an efficient way to better control the software budget. Because this also leads to fewer machines and reduced diversity, it is also expected that personnel costs, administration, and training, for example, will also decline.

Figure 3
Benefits Expected From Virtualization

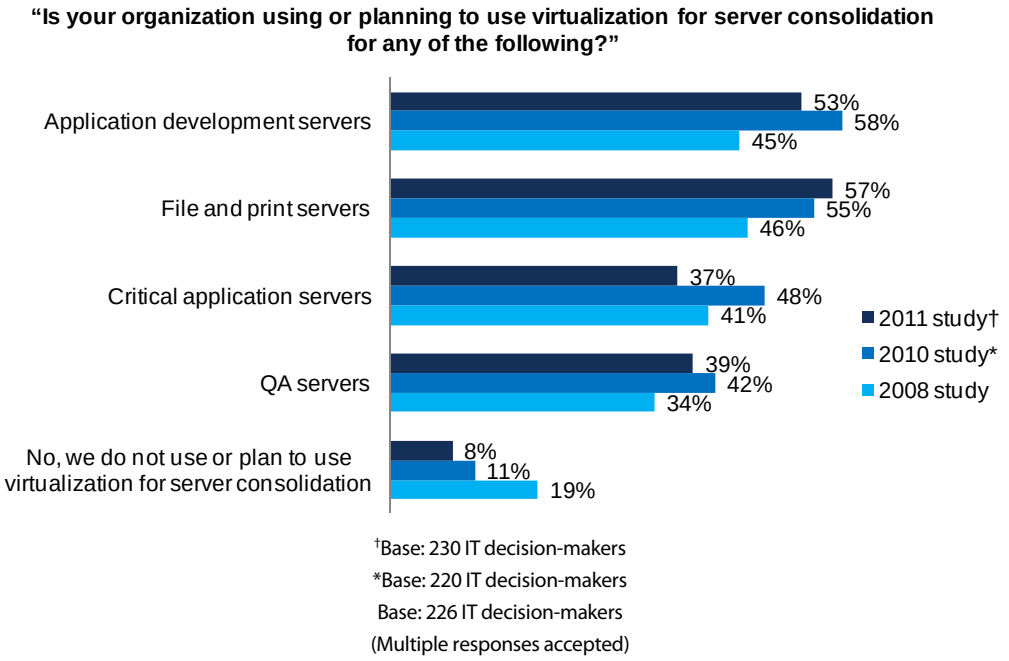


Base: 230 IT executives in North America and Europe
(Ranks "3", "4", and "5" shown)

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

However, a comparison between similar studies conducted at the end of 2008 and the beginning of 2010 show a regression in terms of virtualization intentions, especially when it comes to critical application servers (see Figure 4).

Figure 4
Organizations Using Or Planning To Use Virtualization

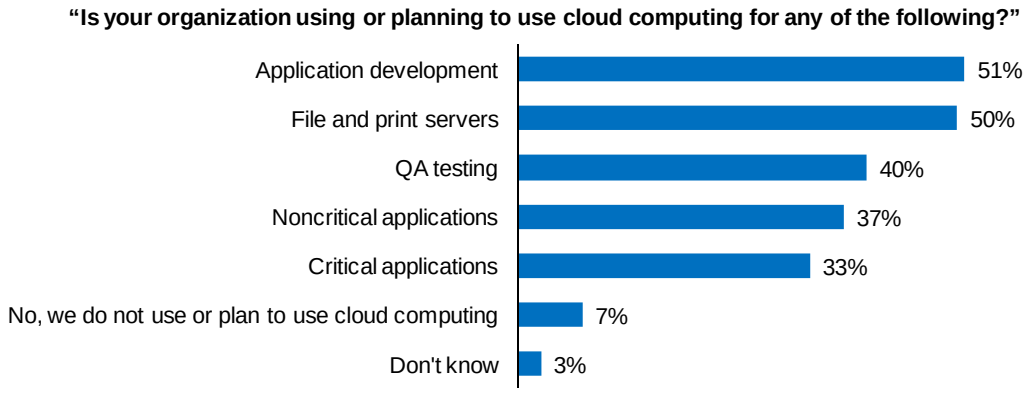


Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011, February 2010, and November 2008

This "virtualization stall" phenomenon can be attributed to the following issues and is most likely a combination of both:

- **Cloud computing appears as an alternative to virtualization.** Our study shows that there is now a strong interest in using cloud computing for a number of applications (see Figure 5). In particular, respondents look now equally at cloud computing and virtualization for delivering critical applications (39% versus 37%).
- **Virtualization becomes too complex to manage past a critical point.** Virtualization stall has been described as a slowdown in server virtualization that occurs when customers reach a certain percentage of virtualized servers. At that point, the complexity of staffing issues, management challenges, and business risks compound the benefits expected from virtualization. In this hypothesis, enterprises find a limit to what could be virtualized effectively with their actual tool set and processes. This creates a "stalling point" in terms of critical servers being virtualized: Depending on the IT organization performance and capacity ability context, an enterprise may have second thoughts about virtualization and either slow down or stop its critical application virtualization projects altogether.

Figure 5
Organizations Using Or Planning To Use Cloud Computing

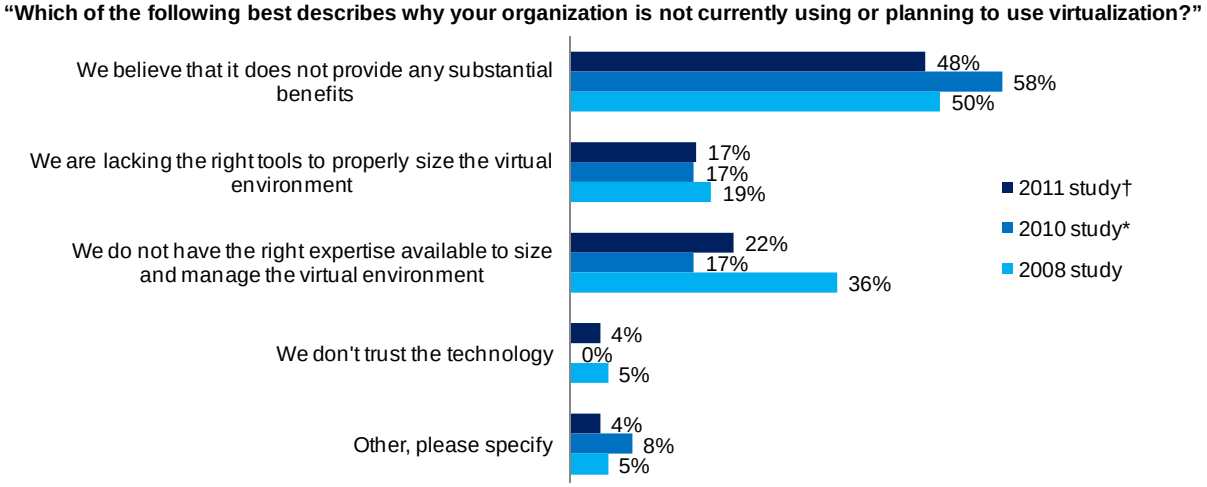


Base: 230 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

It should be noted that the number of "virtualization skeptics" did not vary extensively year to year since 2009, and the variations year to year are within a survey margin of error considering the small number of respondents falling into this category — about 10% for the three years considered (see Figure 6).

Figure 6
Why Your Organization Is Not Using Or Planning To Use Virtualization

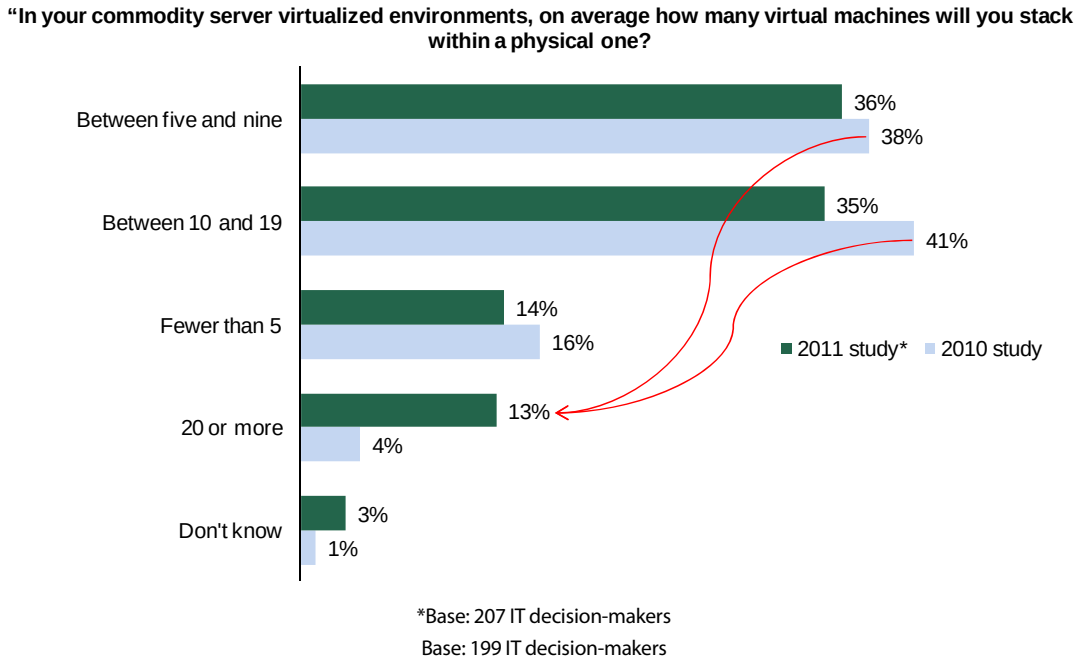


†Base: 23 IT decision-makers who do not use virtualization
*Base: 24 IT decision-makers who do not use virtualization
Base: 42 IT decision-makers who do not use virtualization

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011, February 2010, and November 2008

When asked about the number of virtual machines per physical ones, however, we see a significant growth of the "20-plus" segment to the detriment of the "fewer than 19" segment. Virtualization stall, if it is confirmed, may be the result of the extra complexity brought forth by this increase and the difficulties of IT organizations to effectively manage this complexity. We believe that virtualization is in fact a complexity accelerant that requires specialized tools to control and manage (see Figure 7).

Figure 7
Average Virtual Machines Per Physical Ones

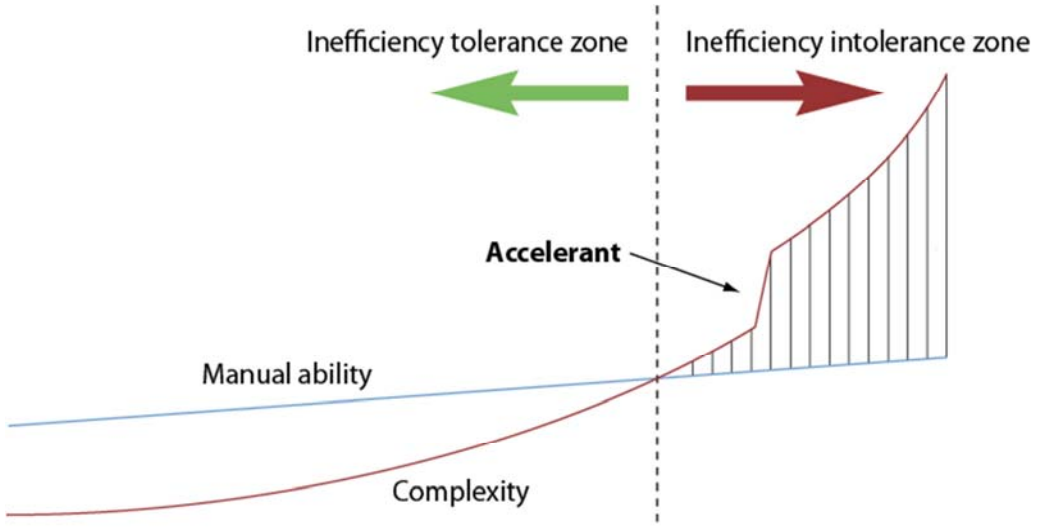


Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011 and February 2010

The Challenges Of Virtualization And Cloud Computing

Virtualization stall seems to give some credence to the difficulties of resolving complexity with more complexity. We believe that in fact virtualization (and cloud computing) are "complexity accelerants" (see Figure 8).

Figure 8
Virtualization And Cloud Computing Are Complexity Accelerants



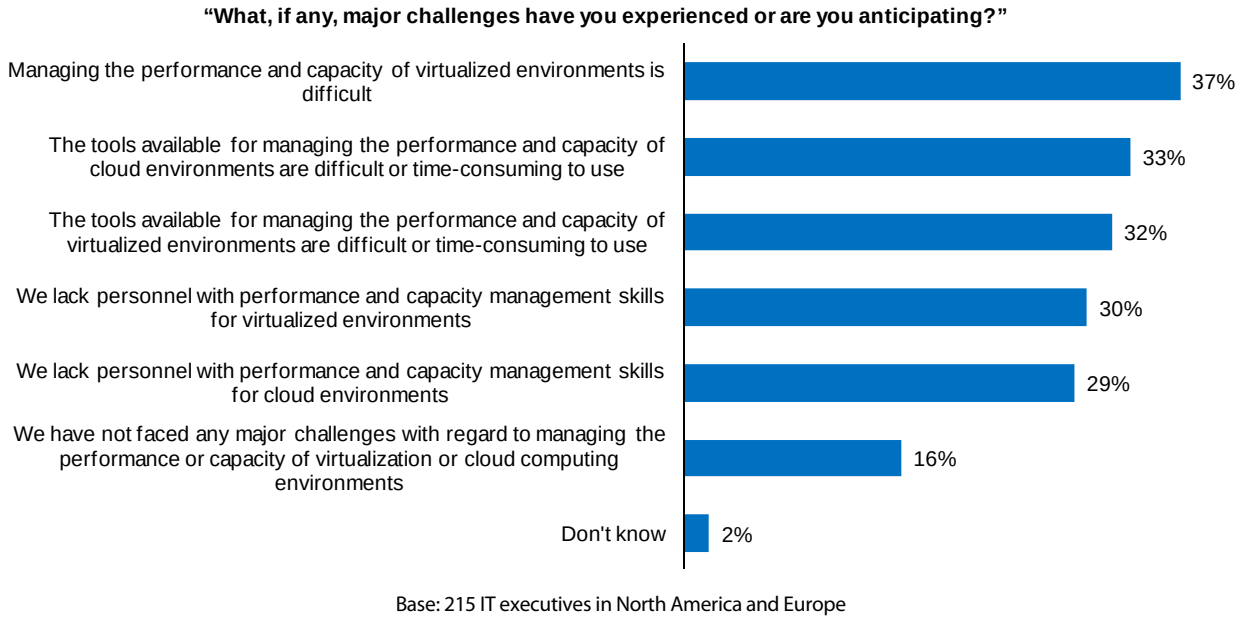
Source: "IT Operations 2009: An Automation Odyssey," Forrester Research, Inc., July 24, 2009

Virtualization and cloud computing users are facing complexity challenges in their virtualization implementation and cloud computing experiences. These challenges can be traced to more difficulties than expected, while the lack of tools and skills compounded the difficulties (see Figure 9).

These difficulties were already present, although to a lesser extent, in the previous years. This actually seems to support the complexity hypothesis of the virtualization stall phenomenon (see Figure 10).

Figure 9

The Challenges Of Virtualization And Cloud Computing

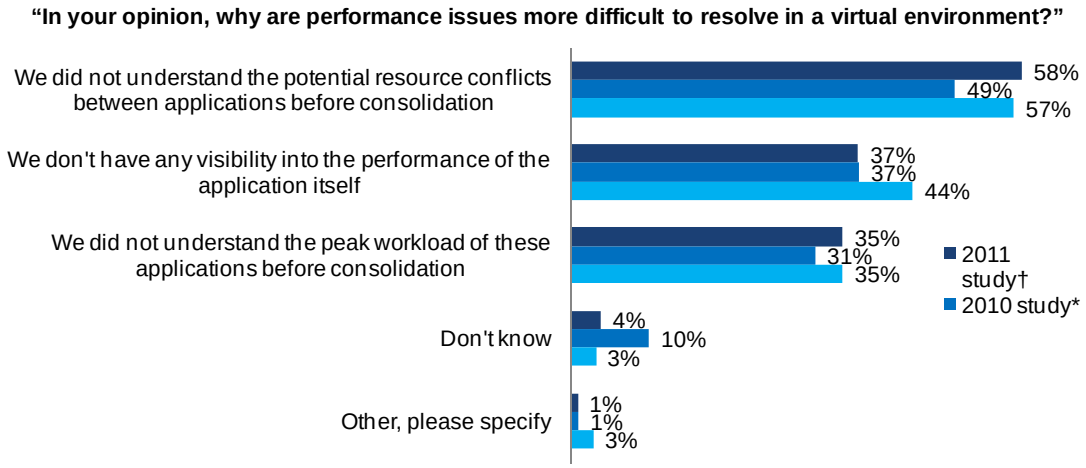


Base: 215 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

Figure 10

Challenges Have Increased With The Multiplication Of Virtual Machines Per Physical Ones



†Base: 149 IT decision-makers who cited difficulty resolving performance issues in a virtual environment

*Base: 89 IT decision-makers who cited difficulty resolving performance issues in a virtual environment

Base: 92 IT decision-makers who cited difficulty resolving performance issues in a virtual environment

(Multiple responses accepted)

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011, February 2010, and November 2008

As a consequence of these difficulties, the resources needed to resolve performance issues in 2011 have actually increased when compared with 2008 and 2010 (see Figure 11 and see Figure 12).

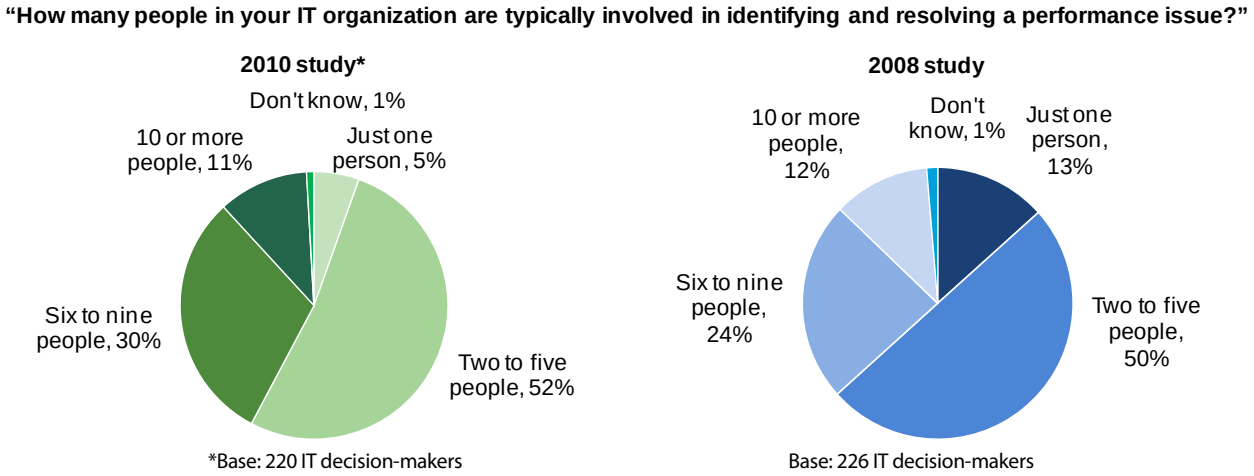
Figure 11
Resources Needed To Resolve Performance Issues In 2011

Base: 230 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

The proportion of errors requiring more than five people did not vary much over the past three years at around 40%. However, the proportion of errors requiring 10 or more people has shot up from 11% to 12% to 19%, signaling that errors are becoming more difficult to resolve when the ratio of virtual to physical machines increases.

Figure 12
Resources Needed To Resolve Performance Issues In 2008 And 2010



*Base: 220 IT decision-makers

Base: 226 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, November 2008 and February 2010

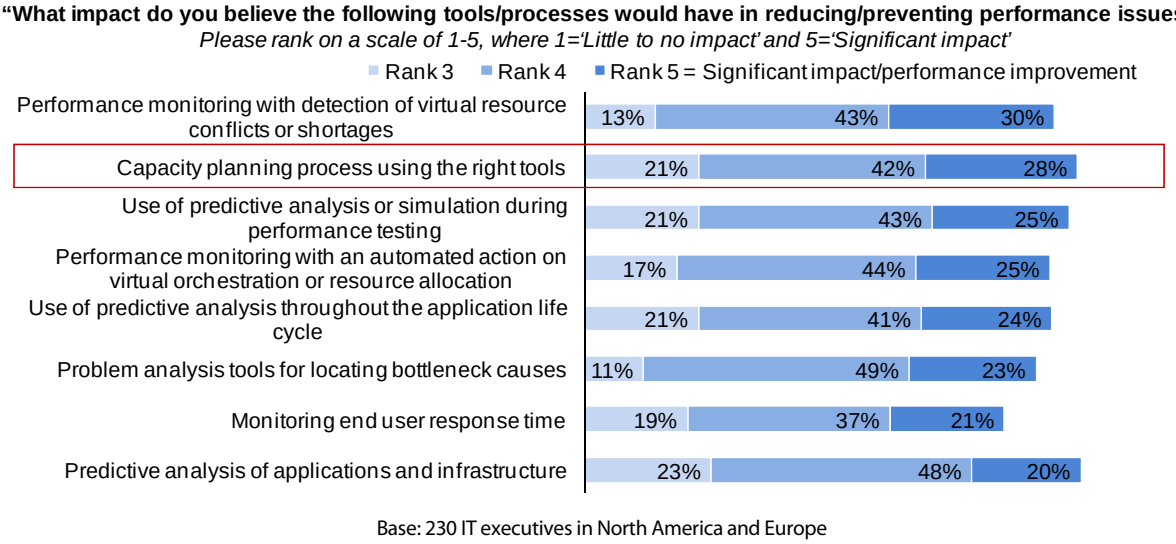
At the root cause of these complexity issues is the lack of process and tools to manage performance and capacity and provide the ability to make full use of the flexibility of computing resources that are offered by virtualization. This is clearly identified in Figure 13. Respondents to the survey consider that:

- **Predictive analysis would give them the ability to virtualize compatible applications.** The first problem to consider in consolidating virtual workloads on a physical machine is to understand the compatibility between workloads. Virtualized applications see virtual resources, and this may lead to conflicts at the physical resource level.
- **Once workloads are consolidated, conflicts may still appear.** Applications are complex and behave at such a granular level that predictive analysis may not unveil all potential conflicts. Monitoring is needed to detect and resolve these contentions through virtual resource orchestration.
- **At the end of the day, physical resources need to be determined.** Because these virtual workloads will reside on a physical infrastructure, planning the capacity requirements is still mandatory. Thus a strong capacity planning process is required.
- **Clouds are not immune to capacity requirements.** Cloud computing using a "pay as you go" scheme does not mean that capacity planning can be ignored. It is of capital importance to understand application capacity requirements (IaaS, PaaS, or SaaS). This is a capital step in making an informed choice and in really taking advantage of the flexibility of these technologies.

The Benefits Of Managing Performance And Capacity

Until the appearance of virtualization and cloud computing, IT had to live with what it had actually built. Today's IT organizations have a choice as to where and how business services will be deployed. The new technologies promise flexibility: the ability to adjust resources to workloads and, consequently, infrastructure cost savings. Because of this, IT can also expect savings in administration and support costs. But this is predicated on IT having a precise and accurate idea of the resources needed to deliver the expected quality of service. Most IT organizations using virtualization and cloud opportunities have found that finding the correct balance between resource capacity and usage is not easy. This shows in the following chart, where respondents to the Forrester Consulting survey emphasize the role of capacity and performance management tools (see Figure 13).

Figure 13
Impact Of Performance-Capacity Tools On Performance Issues



Base: 230 IT executives in North America and Europe

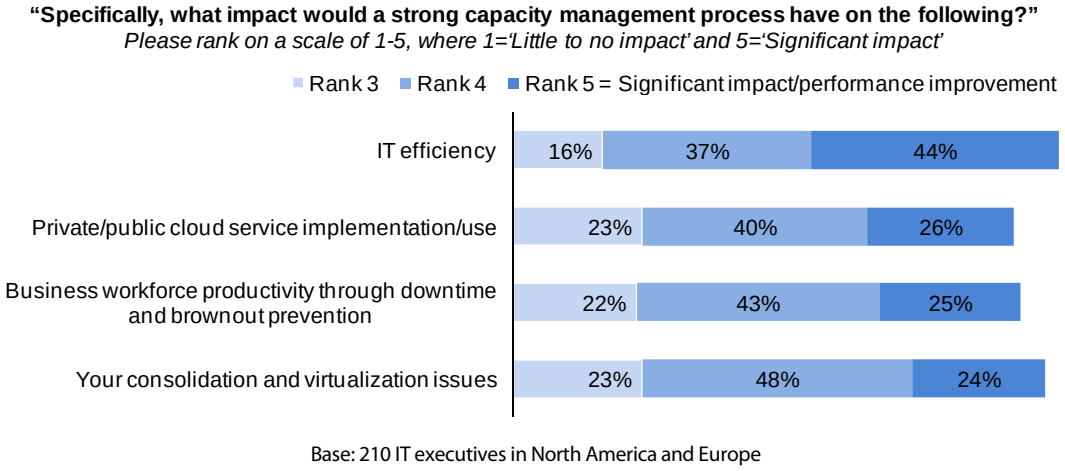
Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

A strong capacity management process is considered by a majority of respondents as the best approach to avoid performance issues in a virtualized environment. Such a process helps resolve the following problems:

- **The initial sizing and placement of workloads.** By collecting performance and workload data into a performance management database (PMDB), capacity management tools are able to evaluate the resource consumption of the different applications to consolidate and provide an estimate of the global physical capacity needed to host these application workloads.
- **The orchestration of virtual resources in production.** Workloads evolve with time and business events. Performance monitoring, linked to resource allocation, lets IT operations take advantage of the flexibility offered by virtualization and cloud computing by providing a "throttle" that will constantly adapt resources to the workload as a function of expected performances.
- **The planning of resources to be provisioned in a public or private cloud.** Because the cost of cloud computing is directly linked to resource usage, planning the capacity needed to process a workload in the cloud is directly linked to an estimate of cost and consequently to an informed decision about the choices that are now available to IT.

Figure 14 shows that a majority of respondents believe that capacity planning and management based on the right tool set has a deep impact on IT efficiency.

Figure 14
Areas Where A Strong Capacity Management Process Has A Strong Impact

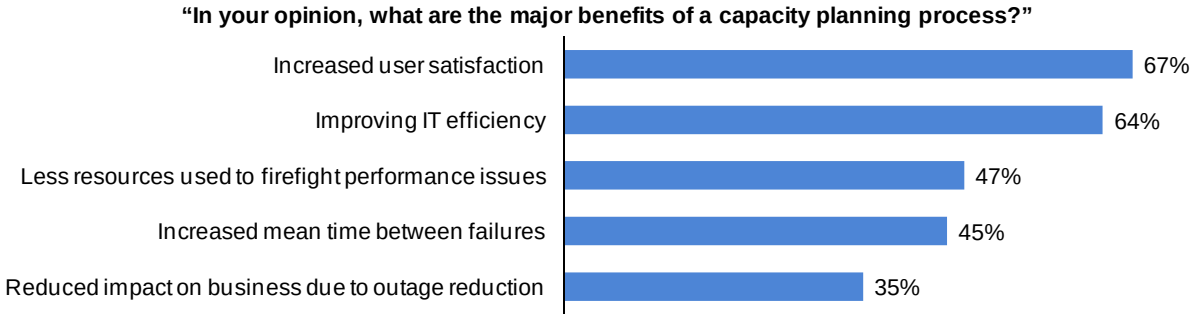


Base: 210 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

A majority of respondents consider that capacity planning and management will thus have a strongest impact on user satisfaction and IT efficiency (see Figure 15).

Figure 15
The Benefits Of Capacity Management And Planning



Base: 201 IT executives in North America and Europe

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011

This is exactly the objective that IT was set to accomplish in Figure 1 by providing the expected quality of service while constantly reducing budget. Virtualization and cloud computing are the two catalysts used to reach these objectives, but they need a strong capacity management and planning to effectively accomplish the task.

KEY RECOMMENDATIONS

Virtualization and cloud computing have been capacity management and planning's catalyst of change. Organizations that did not see a need for managing infrastructure capacity and thought they could dispense with capacity planning by using virtualization or cloud computing now realize that the complexity of these technologies actually reinforces the need for a more sophisticated capacity planning and management process. As virtualization opens the door to a data center where resources can be automatically and simply allocated to suit the specific needs of an application, capacity planning and management becomes a must to control the performance of virtualized applications. The next generation of private and public cloud coming down the pike, as well as the limitations imposed on the data center in terms of facilities and energy consumption, mean that capacity planning has become the key to a better use of IT technological infrastructures.

There are now *more* aspects to capacity management than there were before. Capacity management is more complex.

- There is the traditional predictive element of capacity management. This is the part that forecasts resources needed to deploy an application and consolidate applications on a single physical server supporting multiple virtual guest applications.
- There is a reactive component of capacity management. In addition to detecting and diagnosing performance issues, this component can include verification that extra capacity exists and is available before adjusting resources in quasi-real time to the application needs. This is done by triggering the orchestration mechanisms integrated with the data center virtualization management concept and, in particular, its embodiment in new platforms.
- There is also a need for planning the reactive components of capacity management. This includes determining what reactive orchestrations should be allowed and what infrastructure is needed to ensure that dynamic resource allocations will be successful.

To quickly address the increased complexity of capacity management in virtualized environments requires the use of sophisticated analytical tools that understand the new, more complex environments. It's no longer safe to rely on a capacity management tool set that is just "good enough." The new forms of computing offered by virtualization, provisioning, and automation must lead to a use of a capacity planning and management tool set that understands resource contention and queuing in complex virtualized environments.

Stepping back, another component of capacity management includes the analysis and business decision on whether to use internally provided services, whether virtualized or not, or to go with externally provided services. The current hype places too much emphasis on the capital savings benefits of cloud computing: It is missing an essential point. Until now, IT had to build what it used: What is important in cloud technologies is that it now gives IT a choice of delivery platforms that did not exist before. Software-as-a-service, infrastructure-as-a-service, platform-as-a-service, internal clouds, and virtualized infrastructures offer a variety of choices in capabilities and costs. As with all choices, we need a rationale to exercise it —– and this is what capacity planning is all about. Because it transforms the needs and requirements into actual models of what must be sourced, capacity planning lets IT leaders understand all costs associated with a given solution and thus reach an informed decision. Capacity planning and management is not just the key element that allows IT organizations to manage end user performance and business productivity. Capacity planning and management provides the basis for financial analysis and decision support in infrastructure optimization, facilitating good business decisions about which services to host on and off the cloud.

Appendix A: Methodology

In February 2011, Forrester Consulting conducted an online survey of 230 global IT decision-makers to understand how companies currently view their IT organization, including IT initiatives and processes. Specifically, we looked to gain insight into how companies are working to increase their IT efficiency and understand companies' current use and pain points around server consolidation, virtualization, and cloud computing. We also looked at how organizations currently resolve performance issues and looked to highlight their opinions around the benefits and barriers to capacity planning. In this survey, 44% of respondents were headquartered in the US. The other 56% were equally distributed across Germany, France, the UK, and Scandinavia.

With respect to company size, 16% came from small companies with fewer than 100 employees, 36% came from medium-size companies with between 100 and 999 employees, 34% came from large companies with 1,000 to 4,999 employees, 7% came from very large companies of 5,000 to 19,999 employees, and 7% came from global companies of more than 20,000 employees.

Respondents came from a variety of industries. Special attention was paid to business/professional services, financial services, and insurance.

All respondents came from IT positions; 46% were the senior-most IT decision-makers in the company, 34% were executives within IT, and 20% were a manager or director within IT reporting to an executive in IT. Respondents held a variety of titles such as CIO, CTO, VP/director/manager of operations, director/VP of application development, or IT architect.

Appendix B: Supplemental Material

"The New Capacity Planning Process Requires Three New Steps," Forrester Research, Inc., April 5, 2011

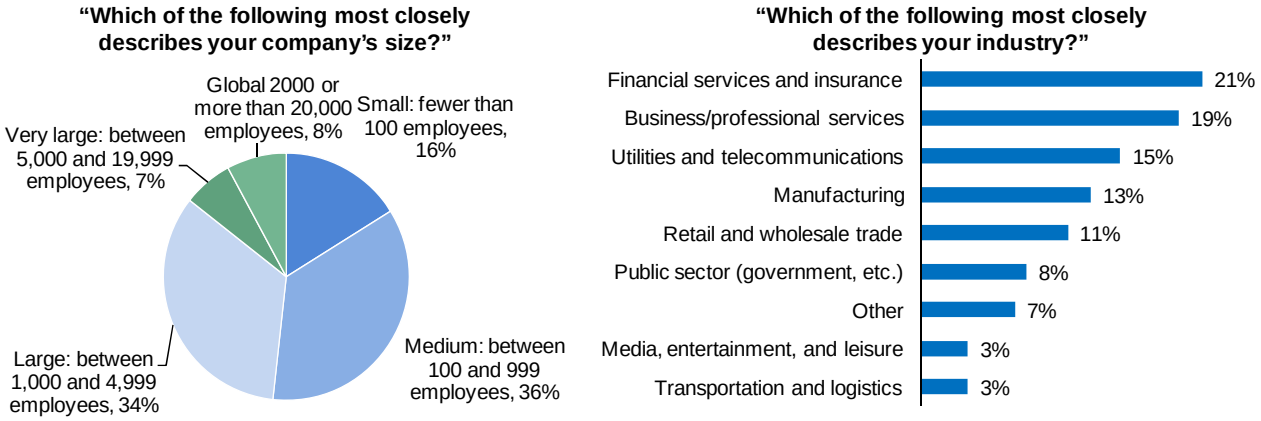
"I&O's New Capacity Planning Organization," Forrester Research, Inc., October 14, 2010

"You're Not Ready For Internal Cloud," Forrester Research, Inc., July 26, 2010

Appendix C: Demographics/Data

Figure A

Company Size And Industries



Base: 230 IT decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of TeamQuest, March 2011