

Forrester Consulting

MAKING LEADERS SUCCESSFUL EVERY DAY

January 28, 2010

Virtualization Management And Trends

A commissioned study conducted by Forrester Consulting
on behalf of CA, Inc.

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

Executive Summary	3
Key Findings	3
Virtualization Is Exploding	5
Operational Challenges Of Virtualization.....	7
Virtualization Management Tool Preferences	11
Actions To Improve Virtualization Management.....	12
Looking To The Future Of Cloud Management	15
Appendix A: Methodology And Demographics	16

© 2010, Forrester Research, Inc. All rights reserved. Unauthorized reproduction is strictly prohibited. Information is based on best available resources. Opinions reflect judgment at the time and are subject to change. Forrester®, Technographics®, Forrester Wave, RoleView, TechRadar, and Total Economic Impact are trademarks of Forrester Research, Inc. All other trademarks are the property of their respective companies. For additional information, go to www.forrester.com.

Executive Summary

In November 2009, CA commissioned Forrester Consulting to evaluate the impact, challenges, and requirements around the operational aspects of virtualization. The study confirms that virtualization is continuing to expand, and the technology introduces new levels of complexity that threaten the stability of services. As day-to-day production responsibility shifts from subject matter experts to operational generalists, new management and automation tools are needed to minimize the risks.

In conducting surveys with 257 IT professionals, Forrester found that these companies achieved operational benefits from virtualization, but challenges remain. Virtualization improved IT worker productivity and service quality, but capacity management emerged as a top virtualization challenge and the needs for automation and including virtualized infrastructure into an overall IT service management movement also surfaced.

To reap the full benefits of virtualization, as with any technology, management must become integral to the broader operational process and tools portfolio. Also, the skills needed for production use of virtualization must change. Specific management expansions must address performance concerns, which are best solved through model-based analysis and tool integration that drive good process execution toward IT operational excellence, as well as through taking a top-down, application-centric approach. Process reigns supreme, but good tools make processes real and give an opportunity to integrate and automate virtual and physical processes, across heterogeneous VM environments.

Key Findings

Forrester's study yielded seven key findings:

- **Capacity management is the top operational concern.** Capacity planning and management are mysteries in a virtualized environment because the exact capacity of the infrastructure is hidden beneath the complexity of the virtualized systems. This causes confusion around managing the performance of the infrastructure, which imposes excessive risk to business services reliant upon virtual servers. The issues are more pronounced than models based on physical servers. Users need improved processes and tools to gain the necessary visibility into capacity and infrastructure performance.
- **Moving to internal clouds requires changes to processes and automation management tools.** The logical extrapolation of virtualization becomes cloud computing, an objective at some level of nearly all organizations. To attain this vision, the common model of IT service development and operations must be replaced. Process discipline, automation and self-service management tools, and organizational changes are inevitable. Without these improvements, internal clouds are impossible.
- **Comprehensive domain coverage is critical.** High among enterprise users' requirements is the ability for management tools to seamlessly and comprehensively manage the other components of the overall virtualized service, which are adjacent to the virtual server, including physical systems, network, and storage, particularly as once separate domain silos increasingly blur as a result of virtualization.
- **A top-down, application-centric approach is needed.** Business requirements revolve around the applications, not the infrastructure. Application analysis is near the top of desired features for virtualization management, and other research shows it is even far more important for broader service management.

- **SaaS and cloud-based offerings are highly desired.** The trend toward software-as-a-service (SaaS) as a packaging and delivery option for management software is gaining momentum. The future evolution of this trend is to offer management in a more dynamic cloud offering. Eighty-nine percent of respondents place management-as-a-service as one of the top three most important components a virtualization management product/service should offer.
- **Operational control is slowly moving away from SMEs.** As any new technology graduates from the testing phase into production, the relevant subject matter experts should gradually relinquish day-to-day operational control of that technology. This is happening but mainly in the United States and United Kingdom.
- **Virtualization has been a boon to operations.** Despite an explosion in complexity, the study suggests virtualization has improved service quality and operational staff productivity and morale. Productivity improves because more server instances must be supported by the same number of administrators, or fewer in some instances. Conventional wisdom would suggest this increased workload would impair morale, but staff members are enjoying the novelty of the new technology. Eventually, this novelty will diminish and automation may be needed to address the heavier workload.

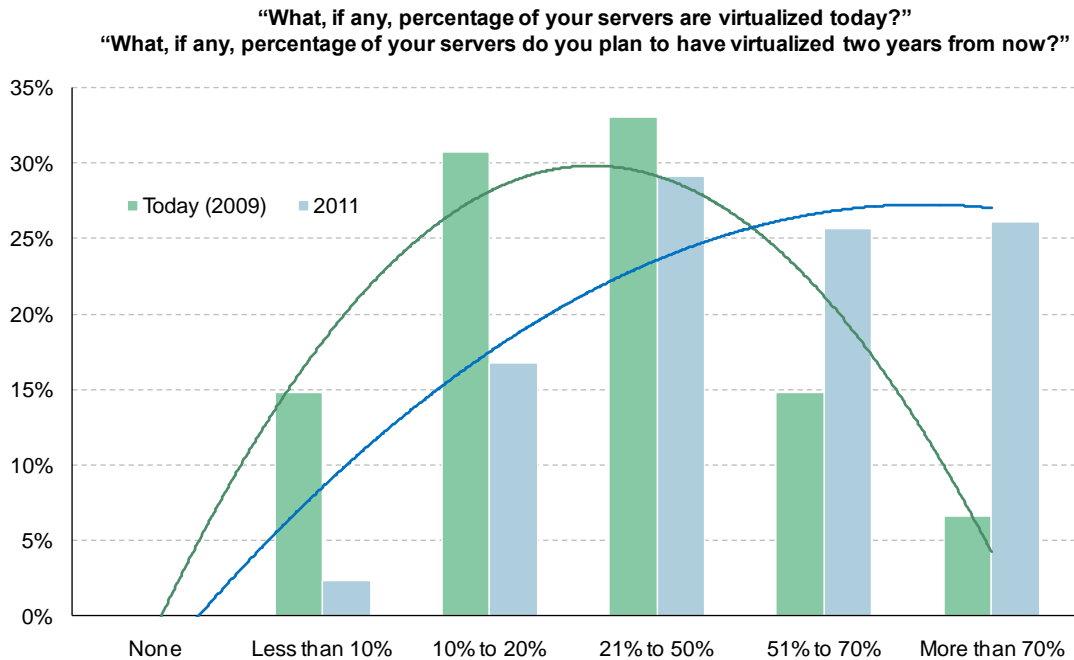
Virtualization Is Exploding

The research clearly indicates that adoption of x86 server virtualization is expanding rapidly and it is an irreversible progression. Virtualization has become a critical element of IT services that is a key foundation for more ambitious internal cloud computing development.

- Virtualization is becoming pervasive in production use.** The groundswell of virtualization's grand migration from test and development to production use began in earnest in 2008. Today, all enterprises surveyed have some level of adoption in production environments. The data clearly shows an aggressive expansion, especially in Europe.
- Varying maturity stages determine value.** As with any pursuit, there are those who attain a higher degree of maturity than others. Here again, the Europeans — and especially the Germans — are more mature than the others. Maturity heavily influences the operational aspects captured in the study. The data reflects this correlation.
- Physical infrastructure and legacy virtualization must be included.** The current excitement revolves around the newer x86 hypervisors, but legacy virtualization, including Unix and mainframe variants are usually included in any virtualization plans. Also, management efforts must span both the virtual and physical worlds to be valuable.

The virtualization adoption responses for 2009 and projections for 2011 are shown in Figure 1.

Figure 1: Virtualization Penetration Is Growing Rapidly



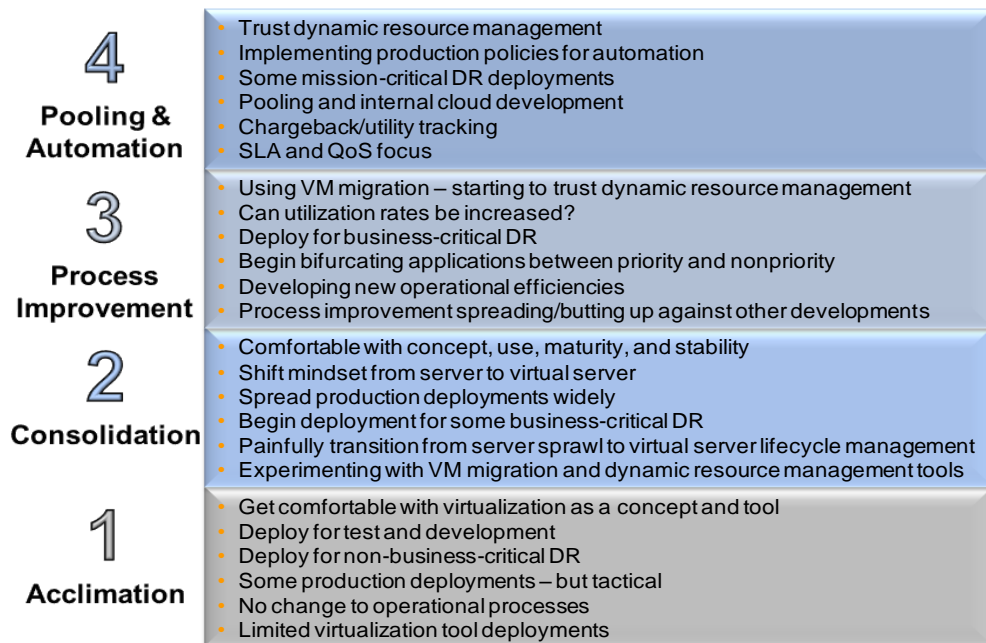
Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

The trend lines tell the story most effectively. The trend line representing 2011 has its peak farther to the right of 2009's line. A strong movement to more virtualization is underway. Detailed data shows that Europe is more aggressive with adoption than the United States and Japan.

Maturity levels are defined by the operational and developmental attributes of virtualization. Forrester specified a four-tier maturity model in July 2009 (see Figure 2). Note how automation and tight management controls define the higher stages. With each transition, manual effort is further reduced and more trust in advanced automation and the whole concept of virtualized systems is gained. Stage 4 is the nascent point of internal clouds with resource pooling and active adaptation.

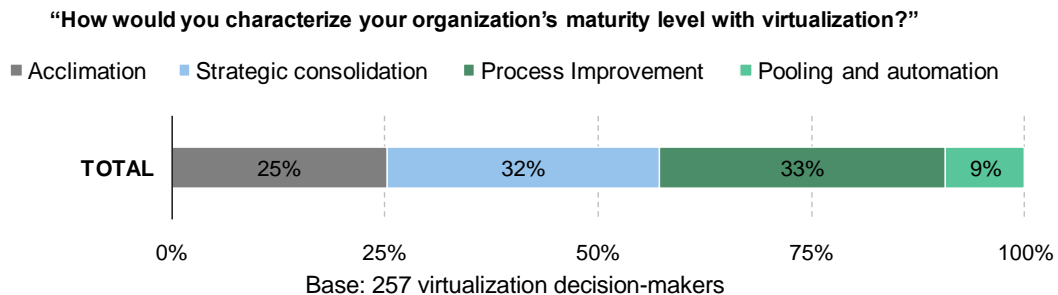
Figure 2: The Four Stages Of Infrastructure Virtualization Maturity



Source: "Assess Your Infrastructure Virtualization Maturity" Forrester Research Inc., July 10, 2009

We asked respondents in the study's various geographies to assess their own maturity levels. The aggregate figures are reported in Figure 3. Europeans are more advanced than the United States and Japan. German respondents claim far more robust maturity than all others, with 53% claiming stage 3 maturity. Even in Europe, however, few claim to have reached stage 4.

Figure 3: Virtualization Adoption Is Expanding Everywhere



Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Operational Challenges Of Virtualization

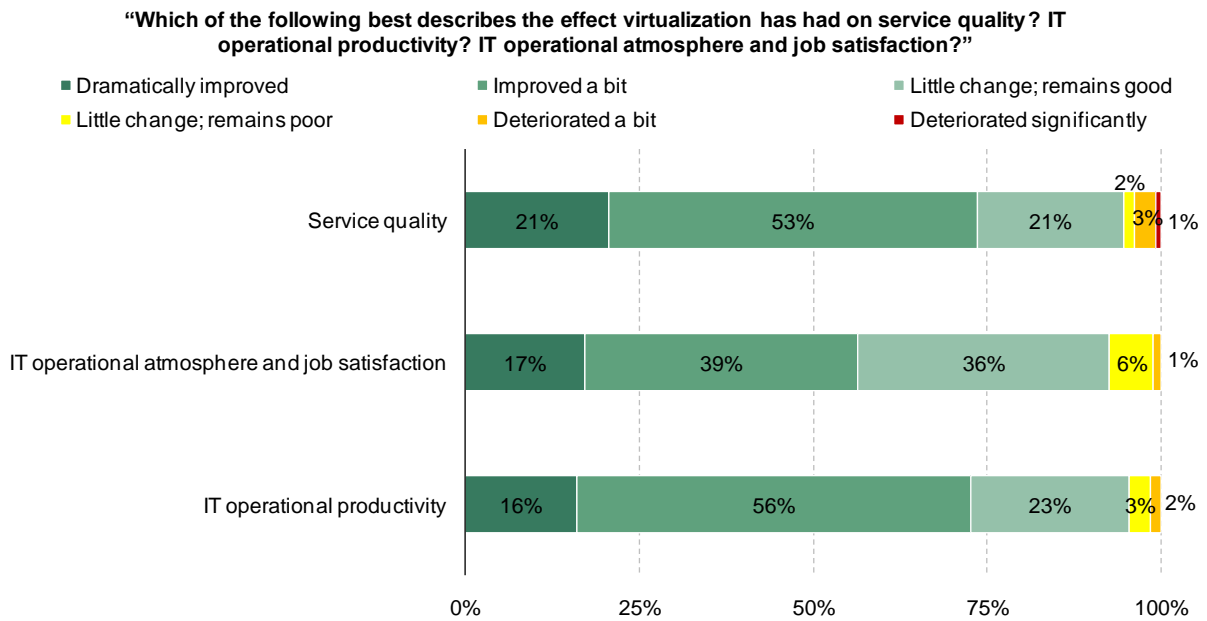
While virtualization has proven to be a powerfully flexible technology for service adaptation, it introduces some new operational challenges and exacerbates many others.

- **Capacity management is a mystery.** By abstracting the virtual servers from the raw physical hardware, the actual resource requirements become ambiguous. This introduces confusion and risk around the performance and stability of workloads that are intended for virtual servers. Many workloads remain on physical servers because the risk is too high. For dynamic private cloud deployments, there is an opportunity to integrate real-time capacity planning with performance analysis.
- **Stakeholders worry about security risks with virtualization.** Any new technology carries more perceived risk. Despite viewing virtualization in a positive light (see Figure 4), the “hidden” nature of virtual infrastructure causes concern about new threats but even more around the risk of instability. The fear is that capacity issues could cause one workload on the physical server to adversely affect others on that same server. This is a critical point in cloud discussions.
- **The proper skills for the future are difficult to attain and retain.** Virtualization marks a notable departure from prior operational models. Existing staff must be trained in the new technology and its complexity mandates automation. As functions are automated, reliance on skilled staff decreases. A potentially dangerous skills gap is emerging. Another skills concern is how virtualization fits into an overall service management movement. Such expertise is currently in short supply.
- **Surprisingly, the risk of making errors is viewed as little concern.** One existing concern regarding virtualization is the notable risk of making errors because of its complexity. This study suggests otherwise. This can be explained by the fact that production penetration is still in its early stages and automation technologies are becoming more prominent and mature to assist with the complexity. This indicates that decision-makers are more pragmatic about the operational aspect of virtualization as compared with prior introductions of new technologies. There is also a growing awareness to integrate physical with heterogeneous virtual management environments using consolidated solutions.
- **Operational responsibility for virtual servers varies by geography.** It is most effective and efficient to consolidate virtual server operations with other domains, away from subject matter experts (SMEs). Examination of the aggregate data from this study suggests only a mild shift from virtual server SMEs, while most have already consolidated their operations. By geography, we see wider swings, with the UK showing the greatest shift away from SMEs.

The challenges shown in Figure 5 indicate that capacity is the top overall concern, but the three choices offer additional insight. Respondents were asked to rank their top three choices. Security and skills were tied for the prevailing No. 1 choice with 11% of respondents selecting them as their top operational challenges. Capacity and obscured visibility were close behind in that No. 1 race.

Figure 6 shows a rather uninteresting pattern over the next two years, as the operational responsibility changes little in the aggregate responses. Digging deeper into the data shows more active dynamics as illustrated in Figure 7. Here you can see a push to outsource in the UK and a gradual shift away from SMEs in the US and UK. This shift is necessary to achieve higher levels of overall operational maturity.

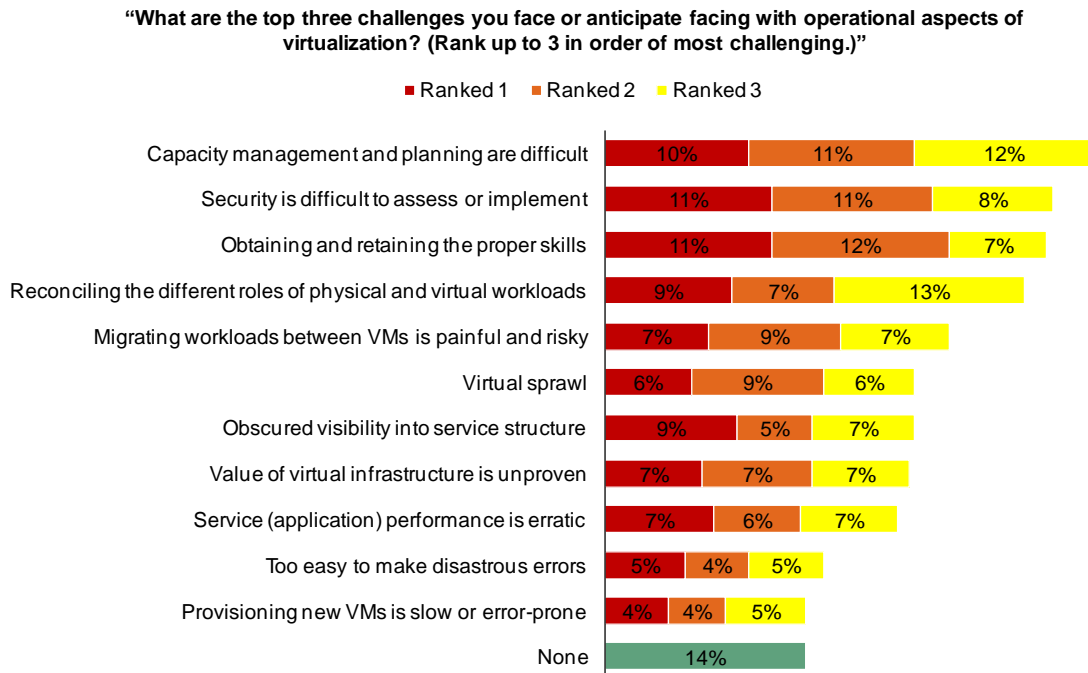
Figure 4: Virtualization Is Viewed As A Positive Operational Contributor



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

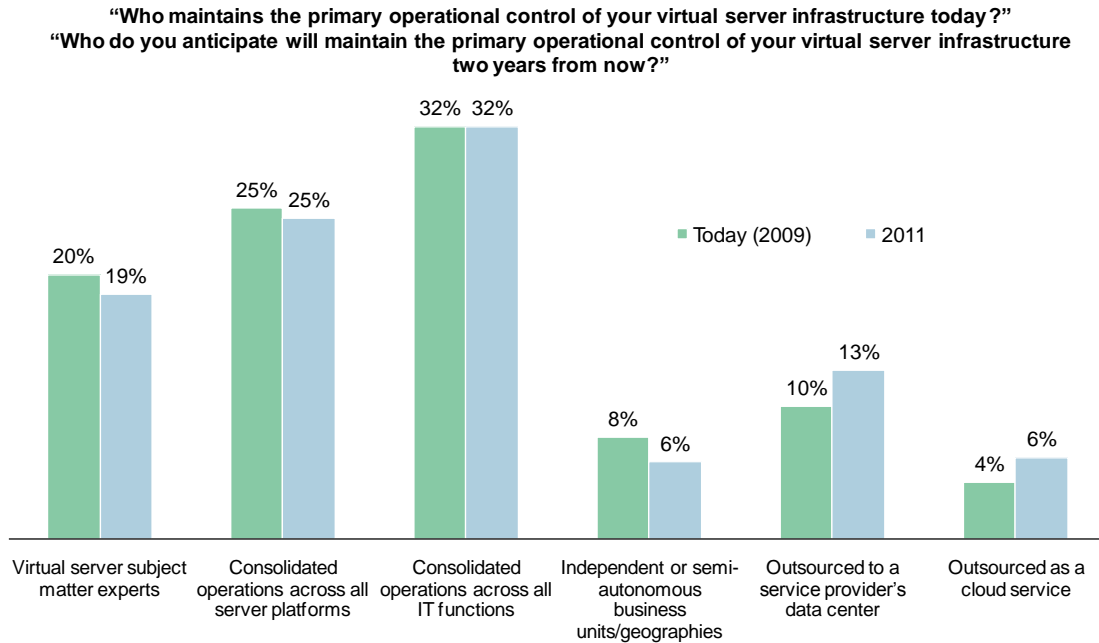
Figure 5: Capacity And Security Top The Operational Concerns Of Virtualization



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Figure 6: Operational Responsibility Changes Little Overall

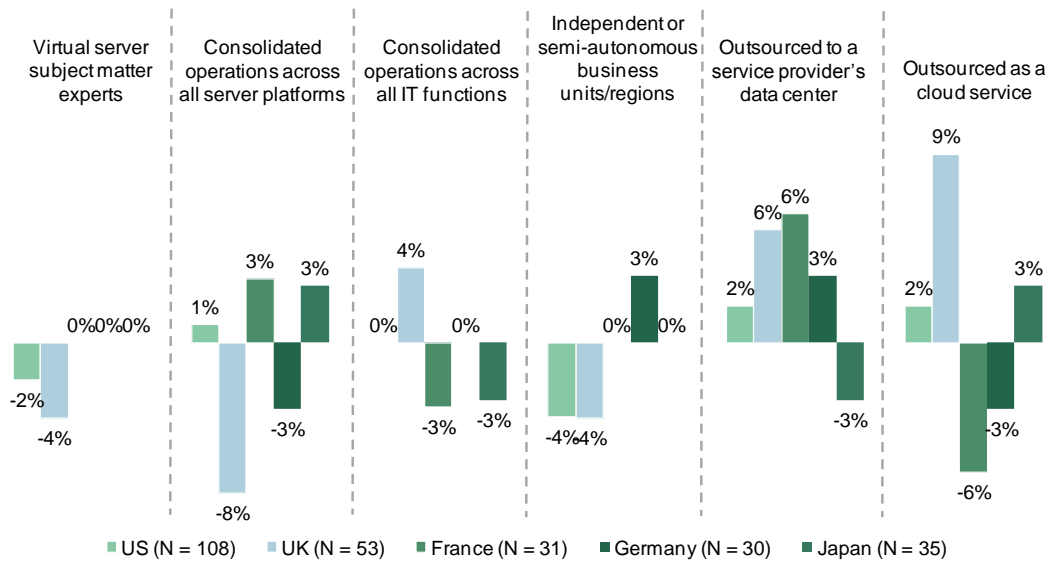


Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Figure 7: Geography Determines More Variance In Operational Responsibility

“Who maintains the primary operational control of your virtual server infrastructure today?”
 “Who do you anticipate will maintain the primary operational control of your virtual server infrastructure two years from now?” (Differences between 2009 and 2011 prediction responses shown.)



Base: virtualization decision-makers in each region

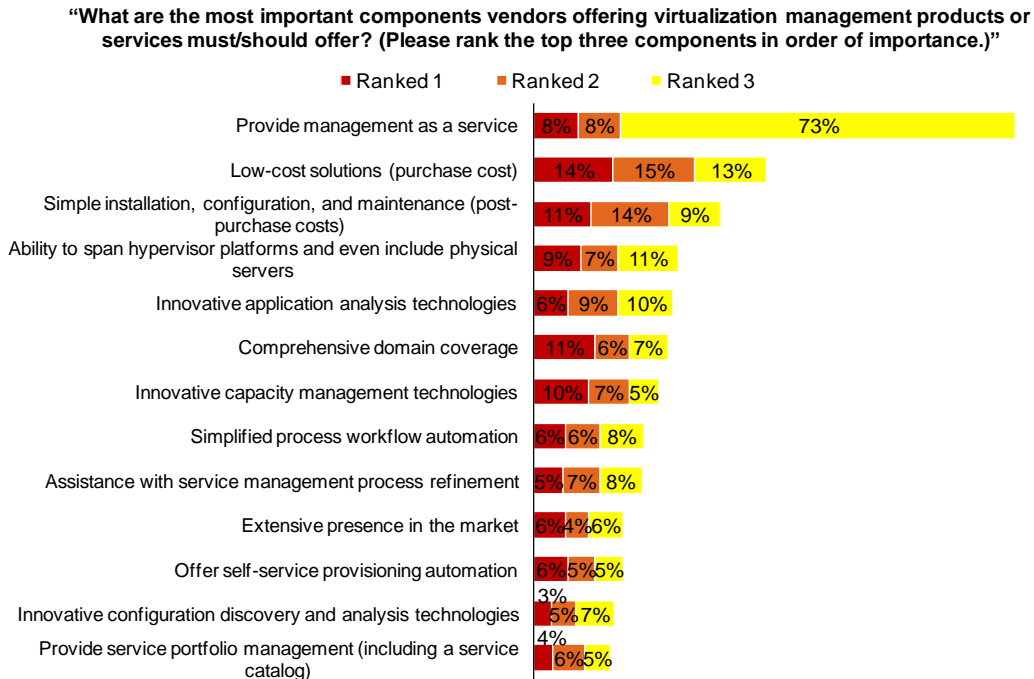
Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Virtualization Management Tool Preferences

Figure 8 lists the requirements for virtualization management tools. The survey asked respondents to indicate their top three requirements in order of importance.

- Low costs are the top software requirement.** Users demand lower costs for management software, not only in the initial purchase but also in the installation, training, and ongoing configuration and maintenance.
- Delivery of these solutions via a service is poised to be nearly ubiquitous.** The study shows this as an overwhelming lead for the third ranked of features given. While raw costs are the lead first choices, SaaS/cloud models will follow shortly.
- Service management maturity is needed but not well recognized.** Evidence of expanded IT service management efforts is strong, yet tool requirements indicate low demand for these capabilities. This is a strong contradiction, but one that suggests a dichotomy between the process-oriented tools for ITSM and those specifically geared toward the virtual server infrastructure. The two are on an inevitably merging progression.
- Automation will be central to the future of IT.** Factors relating to automation surfaced in varying degrees in the study. Operational tasks and processes must become more automated to succeed with advanced stages of virtualization. All research indicates that automation and systems management tools and their integration will grow in importance. Automation technologies that include systems management tools do, after all, form the engine inside the dynamic technologies that enable our business services.

Figure 8: Controlling Costs Is The Top Virtualization Management Tool Requirement



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Actions To Improve Virtualization Management

Virtualization is still in its early phases of operational use. As such, it is compelling refinement in the actual operations processes and technologies. In essence, the newly introduced level of complexity is forcing IT organizations to take actions that are recommended regardless of virtualization adoption. Either way, these actions are necessary, but virtualization is a major accelerant. The survey responses are captured in Figure 9.

- **Virtualization will expand unabated but will standardize.** Virtualization has proven its value and therefore is compelling its own broader adoption. Respondents are remaining loyal to their virtualization vendor of choice, standardizing on that platform with little interest in migrating to another platform. Standardization greatly simplifies the complexity of such environments, and it leads to more reliable services and more nimble adaptation to changing business requirements.

Moving a workload from one brand of hypervisor platform to another is difficult today. It is better to remain on a common platform. Platform-independent software (e.g., interpreted rather than compiled applications) can be migrated more easily. New release management and software development technologies that are already emerging will enable heterogeneous platform support and make heterogeneous platforms more acceptable.

To prepare for this inevitability, an automation software portfolio that will support workload migration across disparate platforms is an absolute necessity. This portfolio must naturally include the provisioning and workload migration functions, but it must also leverage flexible release management tools. Such tools are based on accurate object models representing the infrastructure and the applications, so applications can be deployed and relocated with the underlying software components properly reflected. Each instance of an application may be a bit different in these components. Tools can ensure the right components are in place for the right platform and dramatically minimize the risk of migration.

- **Complete infrastructure and application coverage is needed.** Automation can only be effective if all technology domains are consolidated into a truly unified management software architecture. With 36% of respondents planning to expand systems management and service management principles, this implies consolidation. This has long been a goal of IT operations. Alas, this goal has been elusive because of cultural and technical limitations. The time to break down these barriers is upon us because continued fragmentation restricts the portfolio's value in the new age of dynamic systems.

Tools are finally maturing to encompass this broader perspective. As these improved tools are evaluated, the exercise will compel a more critical analysis and refinement of the entire portfolio. Many incumbent tools will need to be phased out, and this will necessitate the addition of others. In all of these decisions, the basic question will be, "How can this enhance the application view of the world?"

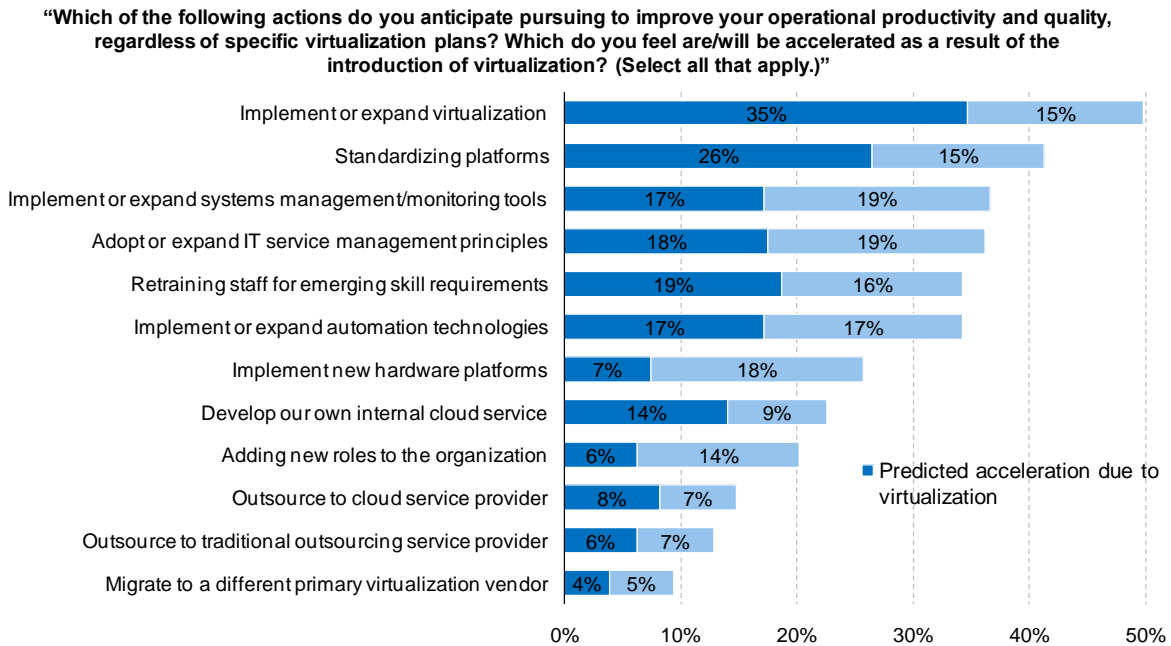
- **A top-down management approach beats bottom-up.** Business requirements revolve around the applications, not the infrastructure. Virtualization and other infrastructure technologies are valuable, but these components are servants to the application. Without strong infrastructure, application stability and performance are horrendous, so close attention is always needed for the infrastructure. From a service management perspective, however, the applications and the relevant application tools drive the most critical decisions. Application analysis is near the top of desired features for virtualization

management, but other research shows that it is even far more important for broader service management.

This top-down analysis and navigation is superior to an infrastructure-centric view that attempts to reconstruct the application from the infrastructure perspective (i.e., from the bottom up). It more accurately captures the services as the end users perceive them. Ideally, the tools will map applications, including the myriad relationships existent in multi-tier applications; monitor the transactions; and link to the underlying infrastructure and software elements. Tools and algorithms to fully analyze all of this information are still evolving, but the building blocks are now here. Analytics are also maturing quickly, a trend that will prove to be one of the top investment areas for IT operational strategists over the next several years, and naturally, for the vendors serving them.

- Processes and software tools are evolutionary keys.** To reach more enlightened levels of operational maturity, the three main focal areas are represented in the service management triad of people, process, and technology. Specifically, skills of the IT staff must be adapted to the new environment, common processes must span all technology domains including virtual servers, and the operational software portfolio must be improved. This software includes traditional systems management tools, augmented by new process automation and integration software. Interestingly, these three focal areas are clustered in the responses to anticipated actions, in a virtual tie as the third most popular choice.

Figure 9: Virtualization Accelerates Service Improvement Activities

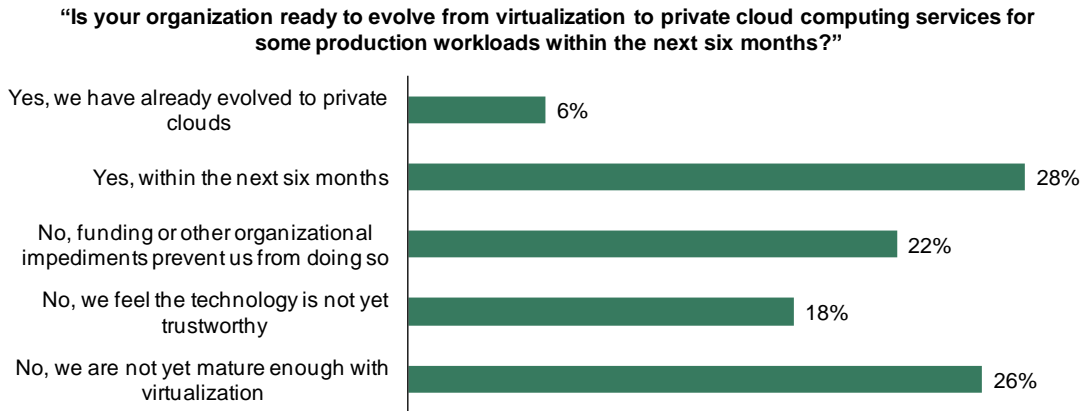


Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

The logical evolution of virtualization is toward cloud computing, with the main interest being on building internal cloud computing services. These internal clouds will be impossible without a strong service management and automation foundation, but early efforts are underway. Most enterprises are not yet prepared to make the leap to internal clouds, as is shown in Figure 10.

Figure 10: Virtualization Is Evolving To Internal Compute Clouds



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Looking To The Future Of Cloud Management

A number of hurdles are impeding cloud efforts. Most notably, the evolution of technology must be in sync with an evolution of trust. IT leaders must trust the technology, but they also need to trust their own organizations. As the study shows, the organization is ill-prepared for the transition, largely because the service management triad is too weak. To succeed at managing the cloud:

- **Stick with standard platforms.** More variations on the platform result in more complexity. The IT environment is already too complex. Standardize platform configurations as much as is practical. Operational productivity and service stability will improve remarkably.
- **Aggressively build the automation technology portfolio.** Technology has outpaced the ability to manage it manually in every large enterprise and many smaller ones. Failure to build and evolve a well-integrated automation technology portfolio will almost guarantee catastrophic failure of the organization as it tries to expand virtualization's footprint. Automation is no longer an optional luxury; it is now a mandate.
- **Force adaptation of the people.** As always, people are the greatest asset of any organization. If skills and organizational behaviors do not adapt along with the technology and the business requirements, however, these same people will be the greatest liability. New sourcing models such as outsourcing, software-as-a-service (SaaS), and the many variants of cloud computing are changing the structural and behavioral complexion of IT. Automation is rendering some jobs obsolete while also creating new opportunities. A bold new definition of the IT organization is emerging now, not at some arbitrary future point.
- **An integrated management software portfolio is mandatory.** The dream of cloud computing is coming into form, but the technologies that govern the behavior of the cloud consist of multiple tools from multiple vendors. This is no easy task and one that highlights the glaring need for tool integration. Integration has been an ongoing battle, but the battles must end. Without tightly integrated management tools across physical and virtual environments, based on solid process discipline, any dream of cloud computing will remain just that — a dream.

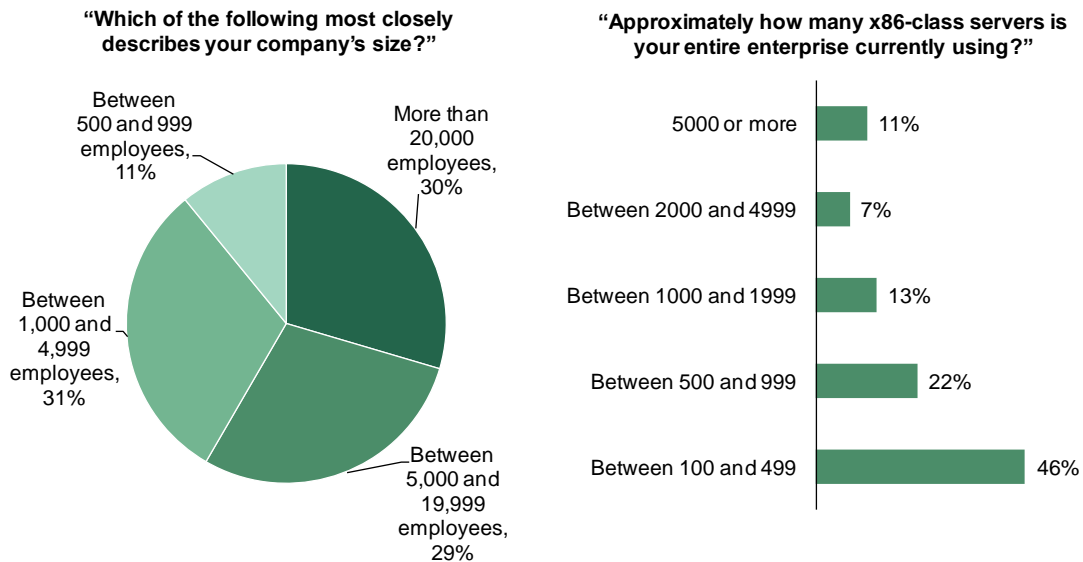
Appendix A: Methodology And Demographics

In this study, Forrester interviewed 257 IT professionals in the US, the UK, France, Germany, and Japan to evaluate current trends in virtualization management. Survey participants included decision-makers (director-level and above) responsible for their organizations' virtualized server environments. Questions provided to the participants asked about the effects of virtualization on service quality, productivity, and morale, as well as challenges posed by the operational aspects of virtualization, details of current management, and future plans for improving operational productivity and quality and the role virtualization may have in accelerating these plans. The study was conducted in November 2009.

Details on interviewee demographics are as follows:

- **Geographical focus:** 108 US, 53 UK, 31 French, 30 German, and 35 Japanese respondents.
- **Organizational focus:** Enterprises with more than 100 x86 class servers and currently employing server Virtualization (see Figure A.1).
- **Size focus:** Large organizations, with more than 1,000 employees in the US and more than 500 employees in additional geographies.
- **Role focus:** VP/director-level and above IT professionals; decision-makers and influencers regarding virtualized server environment.
- **Industries:** Best efforts at even distribution across industries (see Figure A.2).

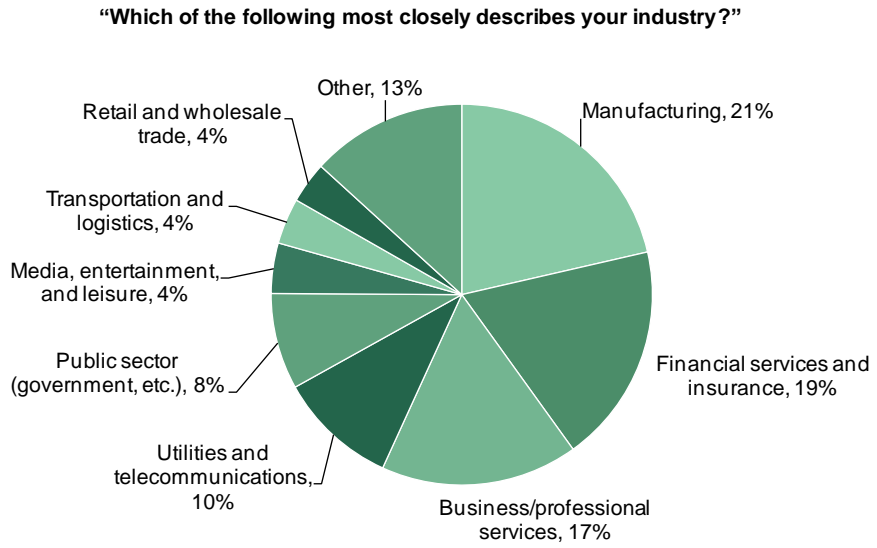
Figure A.1: Organizations Size And Server Usage



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009

Figure A.2: Industries Represented



Base: 257 virtualization decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of CA, December 2009