



Symantec State of
the Data Center Report
2007

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Executive Summary

Today's data centers are becoming more complex and are likely to become even more so in the next five years. Increasingly, businesses are demanding higher application availability and the rapid integration of new technologies. At the same time, the amount of data generated by data center applications is exploding and much of it must be protected, as per new privacy and government regulations, and retained for longer periods of time.

Welcome to the life of data center managers. They are being asked to do more with relatively modest budget increases. Qualified staff is harder to find. And the business side of the organization is asking that applications be deployed in much faster timeframes.

The purpose of this study is to gauge the true state of today's data center, including the issues data center managers face and how they are dealing with them.

The study found that roughly two-thirds of data center managers said their data centers are becoming too complex to manage easily. If dealing with this complexity was not enough, more than half of the data center managers surveyed said internal service-level-agreement (SLA) demands are increasing.

Simply throwing bodies at the problem is not the solution. The majority of managers said it is getting harder to find qualified staff. And more than half of the managers said their data centers are understaffed.

In addition, budgets are relatively flat or show only modest gains.

As a result, companies are turning to cost containment technologies, such as server consolidation, virtualization, storage resource management, unified server and storage management, and data lifecycle management. At the same time, they are implementing approaches to simplify operations, including automating routine tasks, relying on standards, or standardizing on fewer vendors. Others are turning to outsourcing.

Still there is a realization that these approaches can only do so much. There is also dissatisfaction with current solutions. In fact, many managers today are intentionally using limited solutions that do a great job in one particular area, at the expense of others. For example, many rely on the software provided by their storage device manufacturer for data management. The problem is that such software does not support any other equipment in the data center, not even storage devices from other manufacturers.

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Chief Findings

This State of the Data Center study set out to explore the issues data center managers are dealing with today. This report presents the findings from an international research effort that included a detailed survey completed by 800 respondents, in focus groups and one-on-one interviews with data center managers at Global 2000 and other large international organizations.

The key takeaways from this study are:

1) Data Center Managers Are Experiencing Great Stress

The challenge of dealing with growing data center complexity is compounded by:

- The need for high availability (including near-24-hour uptime and robust disaster recovery plans)
- Unreasonable SLAs
- Faster deployment times
- Staffing issues
- Compliance and regulatory issues (more of a concern in United States)

2) Steps They Are Taking to Cope

Managers are relying on a mix of technology and processes to improve their data center operations.

The major approaches taken include:

- **U.S. companies: Technology approach**
 - Virtualization
 - Consolidation
- **Non-U.S. companies: Focus on offloading work**
 - Automation of tasks
 - Outsourcing
 - Standardization to reduce complexity

State of the Data Center Report 2007: Methodology Overview

To better understand the issues faced by data center managers, Symantec and Ziff Davis Enterprise undertook a global quantitative and qualitative study on the state of the data center. The study was conducted in September 2007 and focused on the challenges faced by managers in Global 2000 and other large global organizations.

A number of methods were used to gather data and information. These included:

- An online survey fielded in 14 countries, sample weighted by Gross Domestic Product (minimum 10 respondents per country)
- In-person focus groups conducted in Hong Kong, London, New York, San Francisco, and Tokyo
- One-on-one telephone interviews conducted in Singapore and Mumbai, India
- A teleconference focus group conducted in Canada.

All told, 800 data center managers completed the online survey, and 77 data center managers around the world took part in focus groups or phone interviews.

All participants in the study are responsible for data center operations. They purchase for, budget for, or manage one or more data centers. Seventy-four percent work in IT; 26 percent oversee IT.

The organizations represented have an average of 31,250 employees; 90 percent of the firms have between 7,000 and 120,000 employees. The typical number of data centers in these organizations is 14 or 15. The typical annual IT budget is \$54 million.

(Note: The online survey was hosted by InsightExpress LLC, and field management, tabulation, and statistical analysis was provided by Preference Research LLC. Given the sample size, answer differences in excess of 4.2 percent are statistically significant with 95 percent confidence.)

Factors Impacting Today's Data Centers

Issue 1: Growing Complexity

Data centers have become more complex as IT departments have been asked to support additional users, a growing list of applications, and new technology.

Evidence of this trend emerged in both the qualitative and quantitative parts of this study. The concerns expressed about complexity seem to be universal, as managers from all regions of the world noted that they are dealing with similar frustrations.

“Everything has become more complex and more critical to the business.”
San Francisco

For instance, many managers pointed to the growing pressure to keep systems and applications available 24x7. Driving this demand is the global nature of the Internet and the international extent of many companies. Making matters more challenging is the fact that this high availability now applies even to non-essential applications. As one manager from Tokyo put it, “the time differences between countries requires us to run a 24-hour operation.”

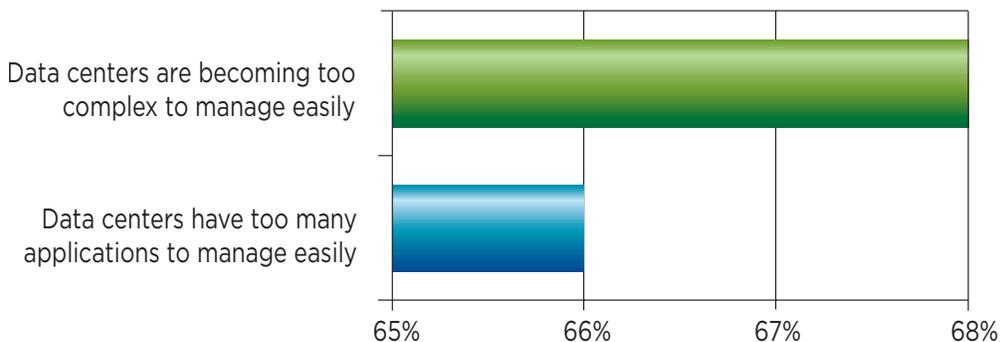
The consequence of the 24x7 operations mode is that there is less opportunity for scheduled downtime. That means more sophisticated technologies such as load balancing, failover, and site and data mirroring must be employed, and this adds to the complexity.

Another factor contributing to the complexity is the need to support new technologies such as Voice over IP (VoIP) and service-oriented architecture (SOA). Others cited the growing number of operating systems and frameworks they had to support as adding a level of difficulty to managing their data centers.

Unfortunately, the situation is not going to change. In fact, most study participants foresee their data centers becoming more complex due to the need to support more applications (and associated data), pressures from end users, and the requirements to meet the growing number of data protection and retention regulations.

Issues Impacting Data Center Productivity

Roughly two-thirds of the survey respondents said their top problems when it came to getting the highest productivity from data center staff are the center's growing complexity and the fact that there are too many applications to manage easily.



To put the complexity into perspective, one need only look at the mix of applications IT departments are being called on to support in the data centers.

Most organizations require a broad range of applications to conduct business. The most common applications include Web, database management, messaging, enterprise applications (such as ERP, CRM, etc.), network file or print sharing, collaborative applications (including project management and scheduling), systems management, and transactional applications for sales, inventory, and trading.

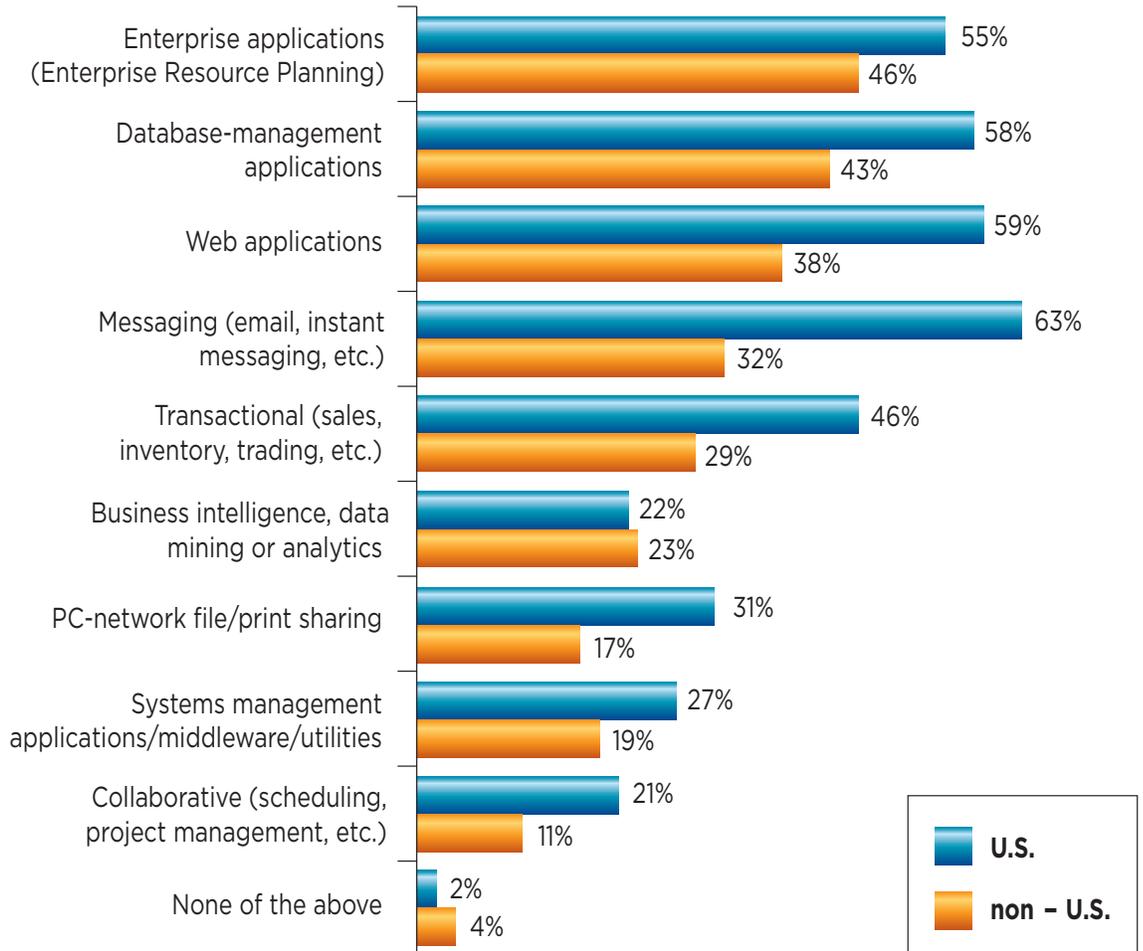
In general, data centers in U.S. companies must support, on average, a few more applications than their non-U.S. counterparts. Additionally, a larger percent of U.S. companies support each of these applications.

Of these applications, U.S. companies consider about four to be mission-critical; non-U.S. companies consider about three to be so. Across the board, enterprise, Web, messaging, and transactional applications were considered to be the most important.

Interestingly, the degree to which an application was considered mission-critical varied greatly between the U.S. companies and non-U.S. organizations. For example, nearly twice as many U.S. managers considered messaging critical compared to their non-U.S. counterparts.

Mission-Critical Data Center Applications

When managers were asked which applications were mission-critical, a higher percent of U.S. organizations rated more of their data center applications as mission-critical.



Adding to the complexity is the fact that these applications are running on a variety of platforms with varying operating systems. For example, the survey found that organizations are using, on average, 964 physical servers to meet their users' demands. Of those, more than half are Microsoft Windows-based servers, about 13 percent are Linux, and the rest are a mix of other operating systems, including IBM AIX, Sun Solaris, HP UX, and others.

Most managers believe their data centers are going to become more complex in the next five years as they are tasked with supporting more applications and new technologies. Notably:

- Several focus group attendees said their users and organizations increasingly require video and Voice over IP applications to communicate more effectively internally, as well as with business partners, clients, and customers.
- Others noted that many of their applications must be re-architected to support the growing adoption of service-oriented architecture.

- A large majority of the managers spoke about the move to virtualization. This technology is viewed as making matters more complex in some areas, such as monitoring, meeting service-level agreements, and ensuring adequate performance for specific applications. One San Francisco focus group attendee summed up these concerns succinctly: “Services are becoming more virtualized, so it’s not easy to say that you have a set of servers in this locale, because it’s really services you’re offering – not just servers that you’re going to support.” However, many believe that consolidation and virtualization will reduce the IT staff’s management and administrative workloads by reducing the number of physical servers and storage devices.

Issue 2: Increased Business Demands

While grappling with the growing complexity of their data centers, managers are also being asked to deliver services with higher availability and better performance. At the same time, they must deal with a growing number of business-related matters, including expanding regulations and the need to rapidly deploy applications to stay competitive.

These factors were evident from both the qualitative and quantitative research.

For example, many managers noted that 24 hour uptime is becoming the norm due to the need to keep applications available across time zones. This and other factors are adding pressures in the form of more and more stringent service-level agreements. In fact, service-level expectations today are such that outages are not acceptable.

The study noted the frustrations data center managers are having with regard to meeting the demands from the business side of their organizations.

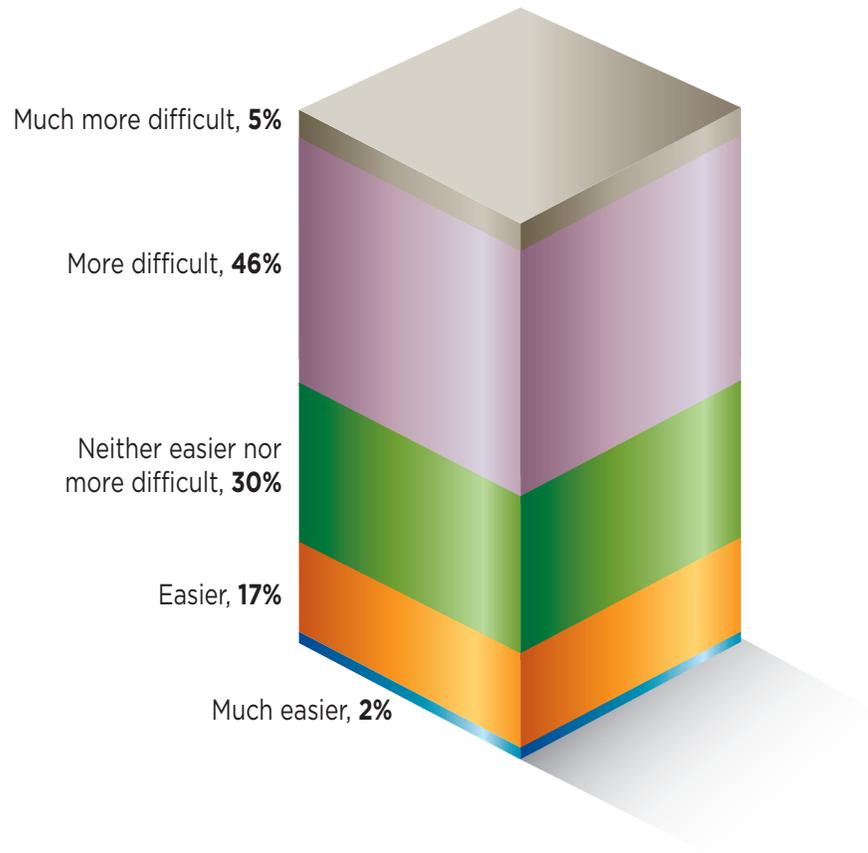
In particular, about two-thirds of the managers said their data centers currently use internal service-level agreements.

Over the last two years, these demands have become more pronounced. About one-third of the managers said their organizations have faced rapidly rising demands on the level of IT service they provide; more than half said the demands were rising gradually over the same time period.

Service-Level Demands Strain Data Centers

During the last two years, many data center managers have found it harder to meet the growing demands for higher levels of IT services, which are often explicitly spelled out in internal SLAs.

Difficulty Meeting Service-Level Demands



While asking IT to deliver higher-level technology services, organizations also want these services to be deployed in timeframes that are significantly shorter than has been the norm.

Several focus group participants noted that in the past, they would have several years to plan, develop, test, and deploy an application, but today the entire process is often compressed into a year or less. “We would use a roadmap and plan on several years to deploy hardware and software, [but] now it is six to 18 months,” said one member of the San Francisco focus group.

One additional factor that is coming into play more often is the need to take regulations into account. Here, data center managers really need direction from their organizations' business management.

Whenever a new project is started or a new regulation comes into existence, the business operations side must provide this information to the data center manager. Specifically, the business side of the house must convey what data falls under each regulation and what the business consequences of a violation would be. Having this information is essential to planning a strategy and to cost-justifying any actions that must be taken.

For example, under the relatively new Payment Card Industry (PCI) Data Security Standard (DSS), Visa may charge a business up to \$500,000 per incident if customer information is compromised. Knowing this, the IT department can propose solutions in which the cost would be offset by avoiding such a fine.

This approach seems straightforward. However, several focus group attendees (mostly managers from the United States) noted that business managers do not always convey the necessary information and often feel the IT department's involvement in this area is an impediment that slows down their ability to bring revenue into the organization.

At the same time, managers surveyed for this study noted that they have a hard time finding data center employees who understand the business issues. As a result, compliance with regulations adds to the other business-related issues data center managers face today.

Issue 3: Staffing

One way to deal with the growing complexity and increased business demands data center managers face is to hire additional IT staff who can help in these areas. However, this is proving harder than one might expect.

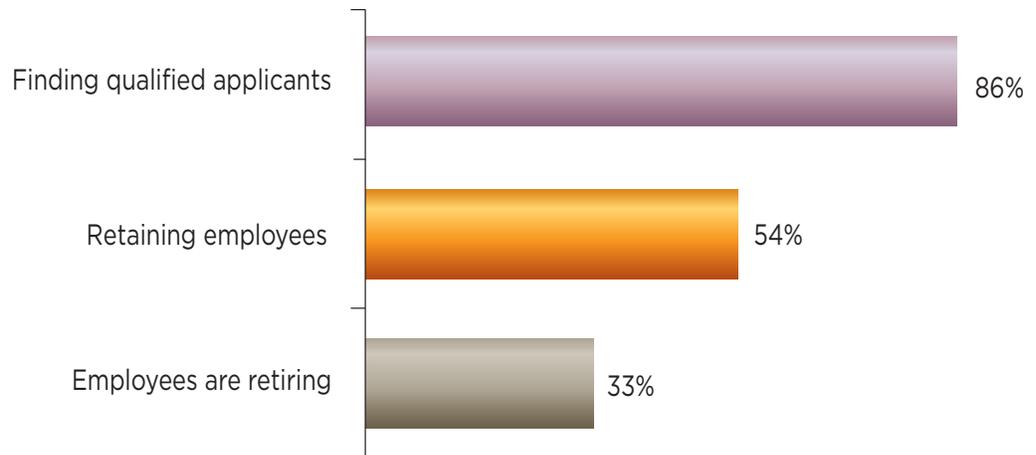
In both the qualitative and quantitative parts of this study, more than half the data center managers said they are understaffed and are having difficulty finding suitable workers.

Most managers realize they need to spend money to find, hire and retain staff. "Real estate's [our] biggest expense and then people," said a San Francisco focus group attendee. But, quite frequently, they cannot find people with appropriate skills.

In fact, the vast majority of managers said finding qualified applicants is a huge or big problem when trying to keep data centers staffed. About half indicated that retaining good employees is a huge or big problem, and about a third said they were losing people through retirement.

Challenges Staffing Data Centers

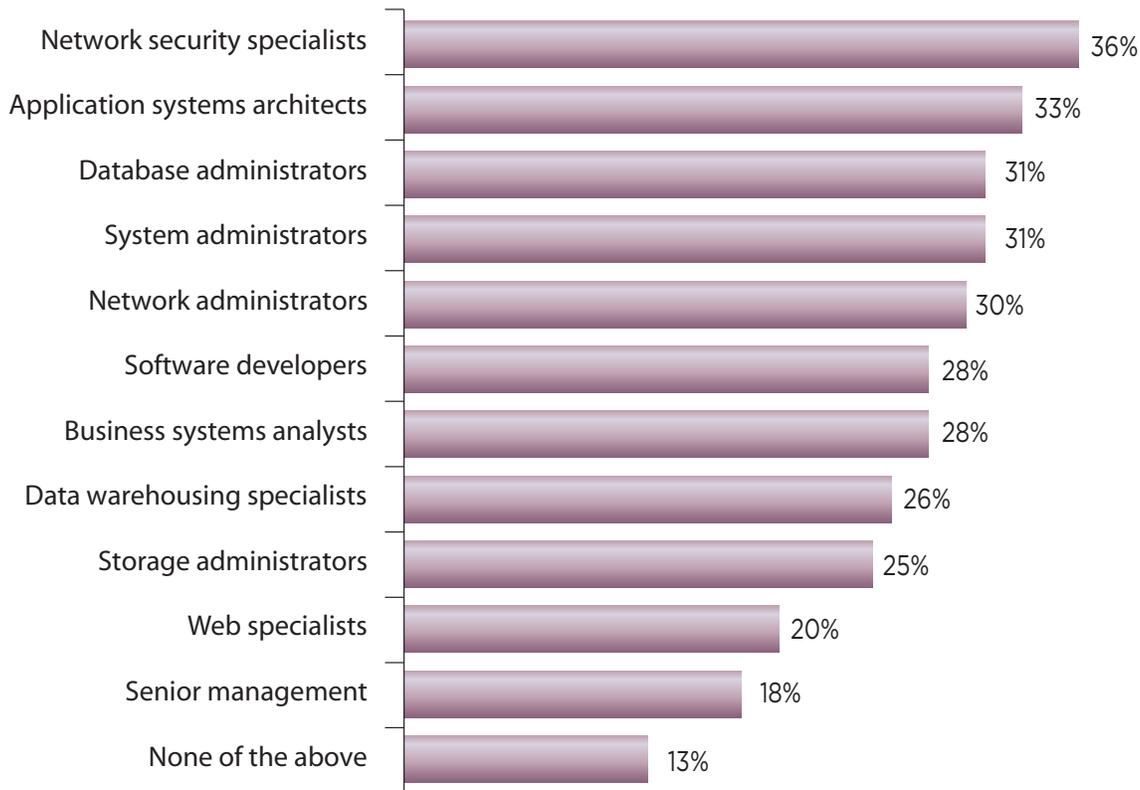
Managers were asked how big or small certain problems were when trying to staff data centers. (The graph below depicts the percentage of managers who said staffing was a huge or big problem.)



Retaining employees was more of an issue outside the United States. However, it was still considered less of a problem than finding qualified applicants.

Special Skills in Demand

Data center managers were asked for which job functions their organizations were having a hard time finding qualified applicants. (See graph below.)



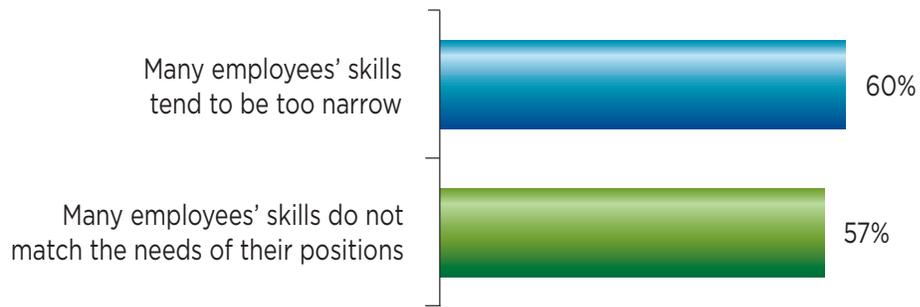
One reason it is getting harder to suitable workers is that more skills are required today than in the past. Staff members need expertise in new technology areas. Again, this is a testament to the growing complexity in the data centers.

Additionally, as business demands for data center services grow, IT employees must be able to effectively communicate with business managers – not just with their IT staff colleagues. This point was borne out in the focus groups where some managers said they could teach IT staffers technical skills, but they had to have the interpersonal skills to work and interact with people and the desire to learn new things in order to be effective.

One problem in finding suitable staff is the industry's past emphasis on specialization. About two-thirds of the managers said employees' skills tend to be too narrow given the complexity of today's data centers and the constant need to support new technologies. And because data centers have evolved rapidly, many employees' skills do not match the needs of their current positions. Both of these factors are making it harder to achieve the highest productivity from data center staff, according to the study.

Staffing Issues

When asked how big or small a problem certain issues were in getting the highest productivity from their data center staffs, many indicated that having the wrong skills or a lack of skills was a huge or big problem. (The graph below depicts the percentage who said these issues were a big or huge problem.)



Issue 4: Data Growth, Storage and Backup

Data center managers are dealing with a number of related issues pertaining to how they manage the data associated with their organization's applications. The big challenge: how to cost-effectively deal with the explosion in data growth created by the increased use of rich media, graphics, and audio and video files.

At the core of the problem is how to simply provide the needed capacity to store the information. Also, the data must be backed up and capable of being retrieved.

In both the quantitative and qualitative parts of this study, managers said the rapid growth in the amount of data they had to manage over the last five years is causing significant changes in their data centers.

Many managers noted that their storage capacity has been doubling every year with no end in sight. This means adding more storage devices, which all take up room, electricity to run and cool, and IT staff time to manage.

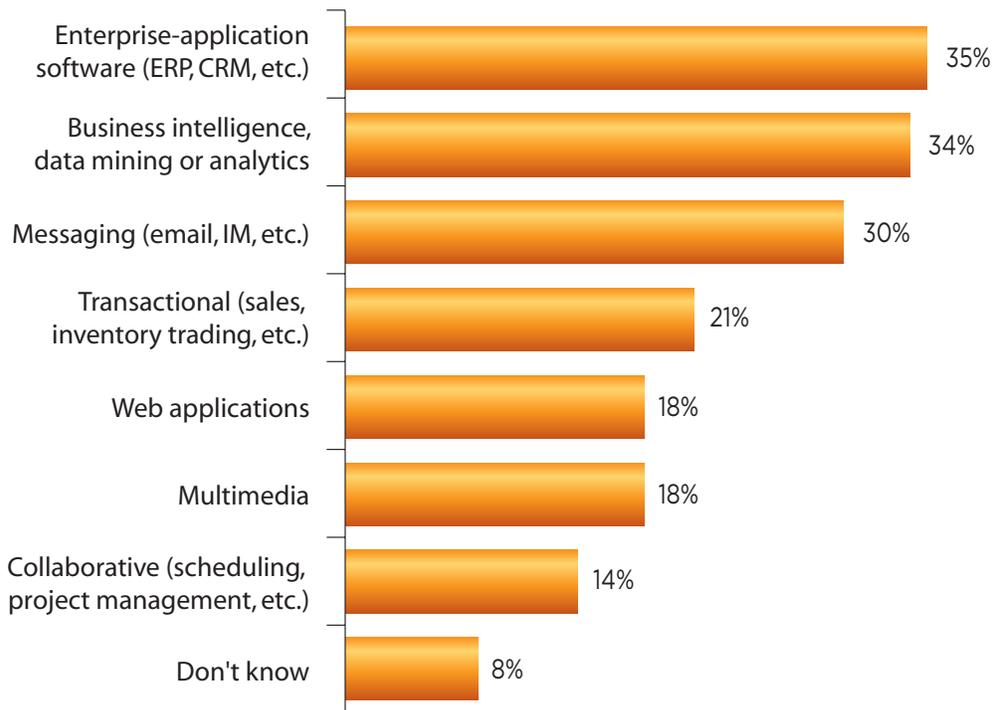
“Backup is really mission-critical for a lot of different applications where you want to do a restore within minutes of downtime.”

Canada

A variety of applications are increasing the storage capacity needs of corporate data centers. According to the survey, the applications considered to be generating the most data include enterprise application software (such as ERP and CRM), business intelligence, data mining, messaging, and transactional applications that support sales, inventory control, and trading.

Data Center Applications Driving Storage Needs

Managers were asked which two applications are increasing the need for data center storage the most. Those designated as generating the most data also happen to be among the applications deemed mission-critical.



Most of these also happen to be among the applications deemed mission-critical. (See “Issue 2: Increased Business Demands.”) The practical implication here is that much of this data is essential to the company’s operations. Thus, provisions must be made to back up the data and rapidly restore it in the event of a natural or manmade disaster, system or hard-drive crash, or the accidental or malicious corruption or deletion of a file or database.

Many focus group participants indicated that this growth of data associated with core business applications is having a significant impact – not just on their backup strategies, but also on their approach to disaster recovery.

From a strictly storage capacity standpoint, even data generated by mission-critical applications does not need to remain on the highest performance (and typically most expensive) storage systems or devices.

The challenge has always been how to tag or designate data so that it can be identified by storage systems and automatically migrated to progressively lower-tiered and less-expensive storage. Complicating matters today is the additional consideration that needs to be given to eDiscovery, data privacy, and data retention regulations.

For example, when it comes to eDiscovery, recent amendments to the Federal Rules of Civil Procedure now impose more stringent rules regarding which electronically stored information must be preserved and presented in litigation in U.S. federal courts. Many lower-level courts now use the same guidelines.

The implication for the data center is that organizations need a way to quickly retrieve such information if it is subpoenaed during litigation. The cost to produce subpoenaed information can be staggering. It often requires pulling archival tapes out of storage and meticulously searching for specific email exchanges or correspondence. In many cases today, companies do not have systems to help automate the tracking of stored information and its retrieval. As a result, many organizations are choosing to settle cases rather than go through the burden and expense of producing the legally requested information.

Data privacy laws are causing a different type of problem. Several U.S. focus group attendees noted that concerns over identity theft and new state, federal, and industry data protection and privacy regulations are making data handling more complicated. For some, there is the added task of identifying which data is subject to the new regulations. For others, it means they must examine when and where data is encrypted. And for still others, there is a need to re-examine how data is backed up and whether protection features, such as the encryption of data on off-site tapes, is adopted.

Similarly, data retention regulations are also causing changes. Organizations must identify information subject to data retention regulations and somehow incorporate retention and purging policies into all of an organization's storage, backup, and data lifecycle management strategies.

Issue 5: Disaster Recovery and Business Continuity

A major issue in data centers around the world is how to handle disaster recovery (DR) and business continuity.

Downtime leads to lost revenue and lower productivity. It can also lead to lost customers. As one New York focus group attendee noted, if his company's Web site is down, a client will simply go to that of a competitor. If they get good service there, they may never return. Downtime can also cause problems within an organization, when internal service-level agreements are not met.

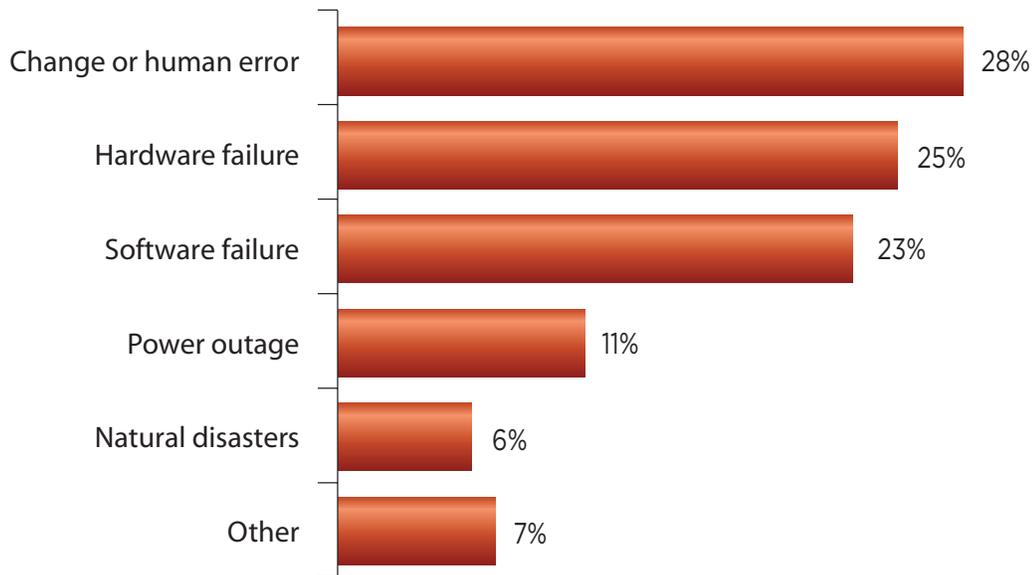
Due to recent events like Hurricane Katrina, many organizations have re-examined their DR procedures. In fact, 53 percent of the respondents indicated they are better prepared for a disaster now compared to two years ago.

Most DR efforts focus on the worst-case scenario (as they rightly should). For instance, many organizations plan for a building being lost in a natural disaster. However, data center managers know that these events, while they must be planned for, are rare. Most downtime can be attributed to less extreme circumstances.

In fact, respondents said that only a very small percent of their downtime was due to natural disasters. The leading source of downtime is change or human error, which accounted for 28 percent of the total, according to the survey respondents. Other contributors are hardware and software failures and power outages.

Chief Reasons for Downtime

What percentage of your data center's unplanned downtime is caused by each of the following?



A little over one-third of the respondents felt their DR plans are either excellent or pretty good. Another third said their plans are average. Many indicated that they tested their plans on a regular basis. However, one London focus group member questioned what constituted a valid test. He noted, for example, that many people do small-scale tests – which do not involve critical systems – on weekends.

Still, the extent to which DR protection is required must be noted. Data center managers feel that not all systems or all data need protection. Respondents said that about 31 percent of their data is not protected, and 34 percent of their remote offices are not, either.

Dealing With Today's Data Center Issues

Complexity, increased business demands, data growth, and staffing issues are driving organizations to seek new solutions to managing their data centers.

Budget Limitations

Unfortunately, data center budgets are growing only modestly. The 500 managers of Global 2000 and other large international organizations surveyed had a typical annual data center budget of \$54 million. Those in the United States reported larger average budgets than their non-U.S. counterparts (\$71 million vs. \$48 million). Also, U.S. companies generally possessed higher budgets.

By the Numbers: Budget Breakouts of the United States Compared With the Rest of the World

- **U.S. Data Centers**
 - Average annual budget: \$71 million
 - 50% have budgets of at least \$85 million
 - 25% have budgets of at least \$120 million
- **Non-U.S. Data Centers**
 - Average annual budget: \$48 million
 - 50% have budgets of at least \$35 million
 - 25% have budgets of at least \$75 million

Survey respondents indicated that about two-thirds of their organization's worldwide IT spending goes to operating their data centers. That 68 percent of the data center budget breaks down to 28 percent of the total IT spending going to hardware, 22 percent for software, and 18 percent for IT servers.

The respondents said that about one-third of their data center budget is for strategic initiatives. This portion of the budget is growing faster than the amount allocated for routine operations.

Quite tellingly, the budget increase over the last two years has been, on average, modest. And most respondents expect budgets to have a net growth of about 7.1 percent worldwide. U.S. companies expect a higher budget growth of about 7.8 percent; non-U.S. companies expect a slightly lower growth of 6.8 percent.

Essentially, data center managers are being asked to deliver more high-quality services in an increasingly complicated environment, yet their budgets are relatively flat. As a result, data center managers find they adopt cost containment strategies that make use of new technologies, including virtualization, and new management approaches, such as those that automate routine processes.

Application of Cost Containment Strategies

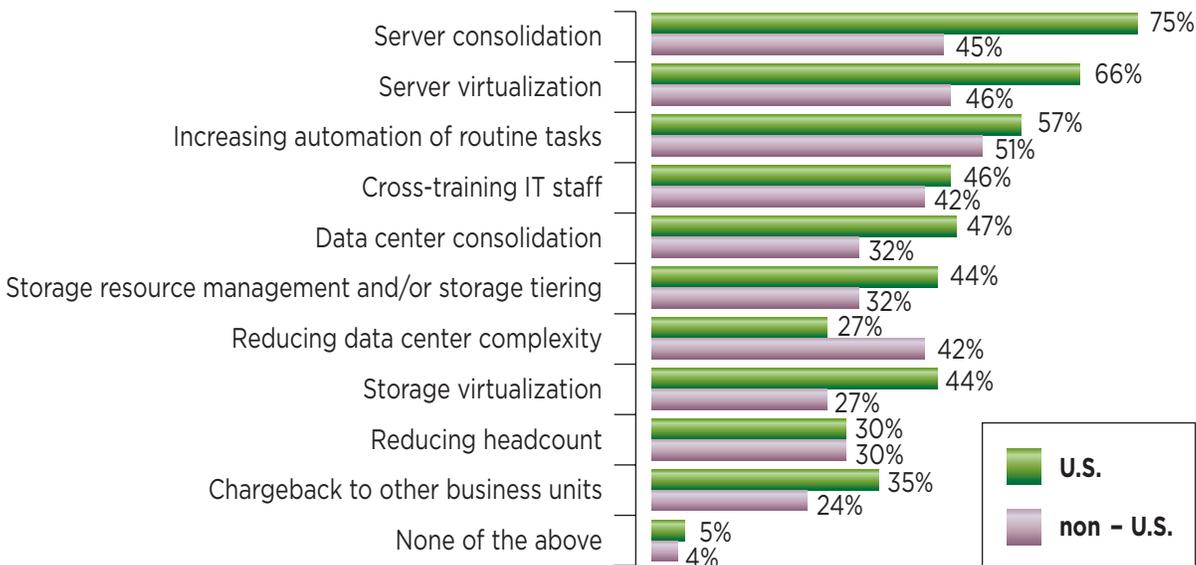
Organizations are turning to a variety of technologies and strategies to help deliver improved services, even while under the constraint of modest budget increases.

In general, the approaches fall into two categories. Some companies are selecting technologies such as virtualization, consolidation, or backup to disk to improve the operations of their data centers. Others are adopting more process-oriented approaches that emphasize simpler management and automation.

In particular, when asked to identify which cost containment strategies they were using currently, most managers cited server consolidation and virtualization, followed by increasing automation of routine tasks and cross-training of IT staff.

Cost Containment Strategies

Which of the following cost containment strategies is your data center currently using?



Typically, a much higher percentage of U.S. companies are using technology solutions than non-U.S. counterparts. One reason for this disparity might be the higher U.S. budgets. (See: Budget Limitations.) Server consolidation requires investment in high-performance rack-mounted or blade servers. So U.S. companies might have more flexibility in acquiring new hardware. This was borne out in the survey results as data center managers whose budgets were expected to increase in 2007 were more likely to be involved in some stage of server consolidation.

Along the lines of the budget's impact on the adoption of new technology, virtualization does not seem to be as intimately tied to ability to spend as consolidation is. Specifically, a higher frequency of those who have at least begun server or storage virtualization deployments report data-center

spending as not rising in the 2006 to 2007 time period. Basically, virtualization is seen as a cost saving measure that can be implemented with a lower initial investment (software licenses vs. high-end server purchases) when compared with consolidation efforts.

While many of these cost containment strategies are being piloted, some are seen as more promising when it comes to cutting data center costs in the next year.

Strong Regional Differences in Virtualization Choices

Many companies worldwide are using or considering server virtualization as a way to cut data center costs. In general, a higher percentage of U.S. companies look to the technology for immediate savings.

Quite interestingly, the choice of virtualization provider varies greatly by region. In the United States, 76 percent of organizations surveyed say they are using VMware ESX, while only 35 percent say they are using Microsoft Virtual Server, and a smaller group is using solutions from other vendors (or open source solutions).

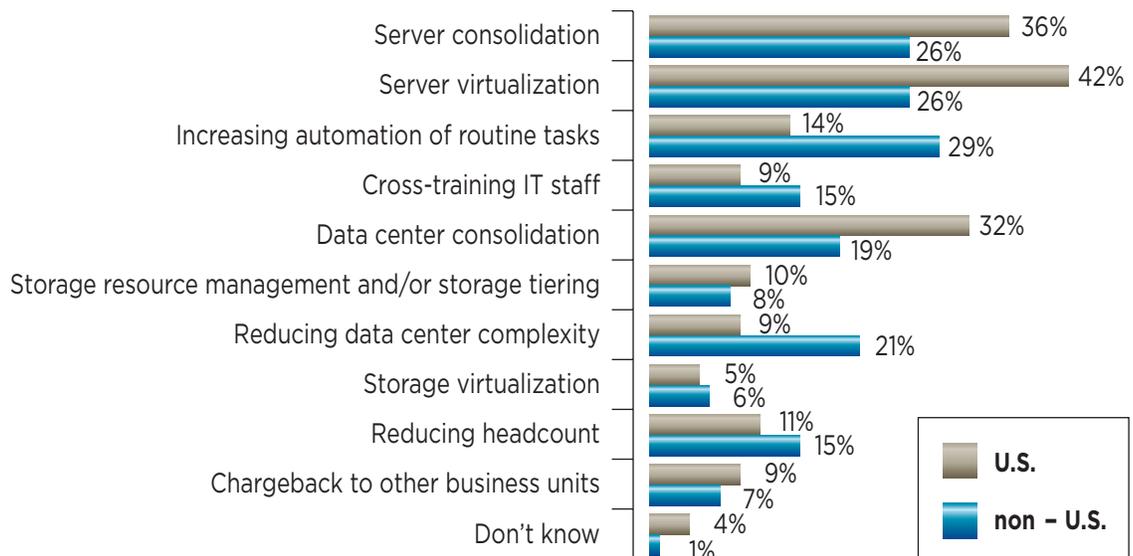
In contrast, 46 percent of respondents from the Asia-Pacific region are using Microsoft, 42 percent are using IBM AIX solutions, and only 35 percent are using VMware.

In fact, in most regions of the world outside of the United States, Microsoft, IBM, and HP virtualization solutions are used by a greater percentage of organizations than VMware.

One reason for the disparity might be as basic as lack of native language support for some virtualization packages in certain parts of the world.

Strategies Eyed for Greatest Potential Cost Savings

Which two cost containment strategies do you think will cut your data center costs over the next 12 months?



Non-U.S. organizations have a different opinion as to which strategies will save them the most in the short term. While consolidation and virtualization are considered important, more managers said automation of routine tasks had the best potential to cut data center costs in the next year.

Again, this might be explained by budget limitations. U.S. companies had, on average, higher budgets and thus would have a greater ability to cover the initial investment technology solutions required to get started. Those with more constrained budgets might need to adopt alternatives. In fact, 55 percent of data center managers with 2007 budgets that are not rising report that they are turning to automation as a significant opportunity to reduce costs.

A more subtle (and most likely less expensive) way to contain costs is to reduce complexity through the adoption of standards. About a fifth of the non-U.S. organizations said they are doing this, while less than a tenth of U.S. firms are doing so.

The cost savings from adopting standards and standardizing IT infrastructure come in several ways. First, there are fewer types of systems to manage. This means IT staff does not need to be trained on as many technologies. Fewer specialists are needed, thus IT staff can essentially be interchanged. (This, in turn, might help alleviate the problem of finding skilled workers.)

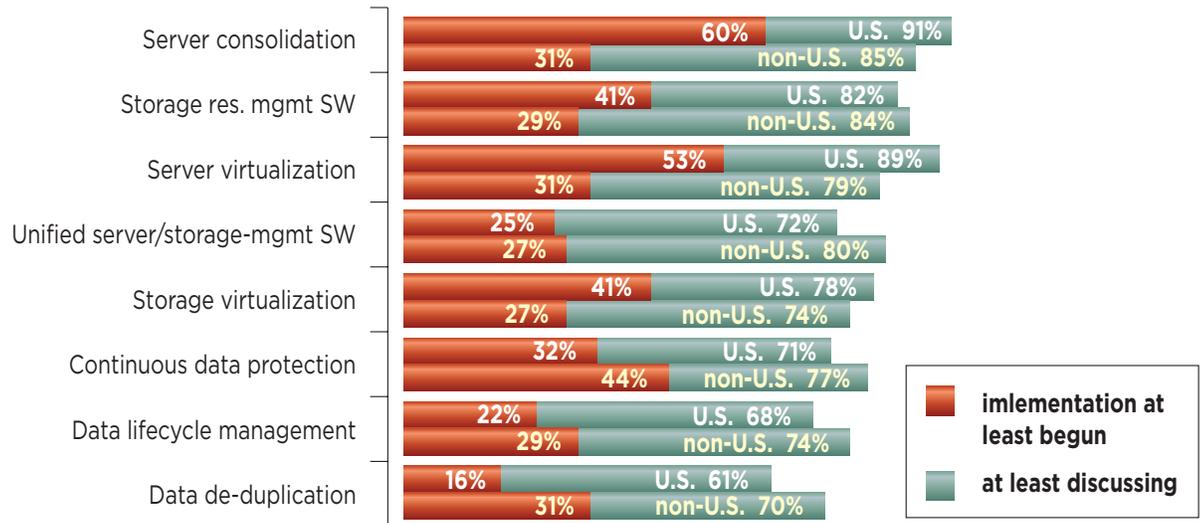
A second cost containment comes from fewer mistakes. When companies standardize, they implement procedures – for example, every new server is built in exactly the same way. This means best practices can be developed and enforced over time.

And one final area where standardization can help contain costs is that fewer spare parts are needed to keep a data center running. If there are 10 vendors' products, you need replacement cables, power supplies, fans, drives, etc., for all 10. If, on the other hand, two vendors' products are used, it greatly simplifies matters.

The interest in reducing data center complexity through standards was well noted in the focus groups. Many non-U.S. participants brought up their commitment to standards such as ITIL (Information Technology Infrastructure Library) to help simplify data center operations. Some also indicated they are moving to use fewer vendors to accomplish a similar objective.

Adoption of Data Center Management Solutions Varies Widely

Which best describes your data center's involvement with the following technologies?



Embracing Consolidation and Virtualization

The cost savings benefits of server consolidation and virtualization are becoming very well known. Numerous trade journal articles and case studies have illuminated the significant long-term hardware savings and reduced operating costs that follow the initial investment in new hardware.

As such, both technologies are being considered widely around the world. However, a much smaller percentage of non-U.S. companies have actually started implementing either technology. Sixty percent and 53 percent of U.S. companies have, respectively, implemented server consolidation and virtualization projects, while only 31 percent of non-U.S. companies have done so with either technology. As noted above, the reason for this disparity might be explained by budget limitations with regard to consolidation and by limited language support for software when it comes to virtualization.

While both technologies are widely embraced, one factor to remember is that many organizations are not yet ready to run their important applications on such servers.

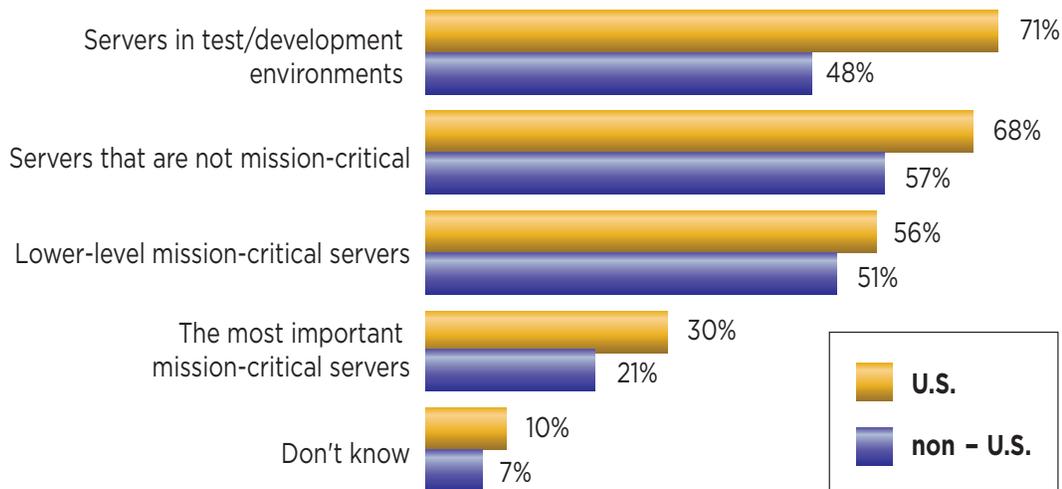
Only 34 percent of U.S. companies and 27 percent of non-U.S. companies are considering or running mission-critical applications on consolidated servers.

One reason for this cited in the focus groups is that existing servers were doing a good job running these applications, so it doesn't make sense to simply replace them just to adopt a consolidation strategy. However, many participants did say that as equipment is phased out, they will consolidate applications onto the newer, higher-performance servers.

Among those surveyed who said they were at least discussing server virtualization, a slightly higher percentage of organizations were considering virtualization for their more important applications.

Virtualization Server Strategy

Which types of servers are you virtualizing or considering virtualizing?



More than half of all organizations are virtualizing or considering virtualization for low-level, mission-critical applications; significantly less are doing so for their most important mission-critical applications.

Focus group attendees had various reasons for the higher uptake (vs. straight consolidation) on virtualization with regard to mission-critical applications. For instance, some said it was easier to virtualize than consolidate, as virtualization requires only software. Others noted that the built-in resiliency features (for example, high availability, load-balancing, failover, etc.) incorporated into some virtualization solutions made virtualization a good match for their important applications.

However, study participants said there were several factors keeping virtualization off mission-critical servers for now. For example, similar to the case with consolidation, nearly half the respondents said they had already invested in physical servers to run these applications. About a third felt the high availability and disaster recovery tools for virtual servers were not robust enough for these applications. (Remember, some focus group members said these features were the reason they were using virtualization. So the choice might depend on a particular vendor's virtualization solution or the exact features required by an organization.)

In addition, some managers simply felt that virtual server solutions are too new or immature to be used for their most important applications.

Storage Management

The explosive growth in data is an area that's ripe for data center cost containment.

As applications generate more and more data, that data must be stored, backed up, and archived on an appropriately selected device that meets the price/performance criteria of the business. Storage devices can include everything from a high-performance storage area network (SAN) down to tape drives and cartridges. All these devices must be managed, and their data must be backed up and protected.

Data center managers understand the complexity of this entire operation — complexity that adds to the cost of running a data center. To help drive out or contain the costs associated with all storage-related tasks, organizations are using a variety of technologies, including storage resource management (SRM), unified server and storage management, internal “storage as a service” solutions, deduplication, and data lifecycle management.

For example, SRM is being considered by more than 80 percent of all managers. About 42 percent of U.S. organizations have begun implementations; 31 percent of non-U.S. firms have done so.

The great interest in SRM is primarily due to the benefits it provides when managing a mixed-vendor, mixed-device storage environment. In particular, 58 percent of the respondents who were at least considering SRM said it would help simplify management of their storage tiers; 54 percent said it would also help automate many of the manual processes they must now perform.

Managers are looking for a different set of benefits when it comes to data lifecycle management solutions. Forty-five percent expect these solutions to increase operational efficiency; 43 percent indicate that they offer an opportunity to reduce costs.

Worldwide 45 percent of the survey respondents said increased operational efficiency was the biggest driver of data lifecycle management automation for the data center. However, the interest was much higher among Asia-Pacific Japan respondents, as 56 percent said it was the biggest driver.

Obviously, one way to lower the costs of storage management is to reduce the number of devices and total disk space. The fewer devices used and the less disk capacity consumed, the lower the capital and operational costs will be.

That's the idea behind data deduplication, which typically stores a single instance of a file or record and creates a pointer to that information. Deduplication is commonly used in messaging applications. For example, if an attachment was sent to 100 people, it would be stored only once, thus saving the disk space that would have been required to store the other 99 copies.

About three-quarters of non-U.S. organizations are considering deduplication; 61 percent of U.S. firms are evaluating this approach. Implementation is also a bit stronger outside the United States: Twenty-eight percent of non-U.S. companies have begun implementations, while only 14 percent of U.S. companies have done so.

Storage Virtualization

Recognizing the benefits that can be realized from server consolidation, data center managers are also exploring storage virtualization. Roughly 80 percent of the managers worldwide who took part in the study said they were at least discussing storage virtualization; 40 percent of U.S. and about a quarter of non-U.S. companies had begun implementations.

To be clear, managers are considering two types of virtualization.

The first is storage block virtualization, in which blocks of storage capacity on different arrays appear to be part of one storage array. More than half of the respondents said they were using this approach.

The second type of storage virtualization is file virtualization, in which files stored in different locations appear to applications to be part of a single file system. About 45 percent of the respondents said they were using this approach.

Most managers said they were using storage virtualization to manage their “moderately important” storage tiers. About a third said they were using it for their mission-critical storage tiers.

Backup and Archiving

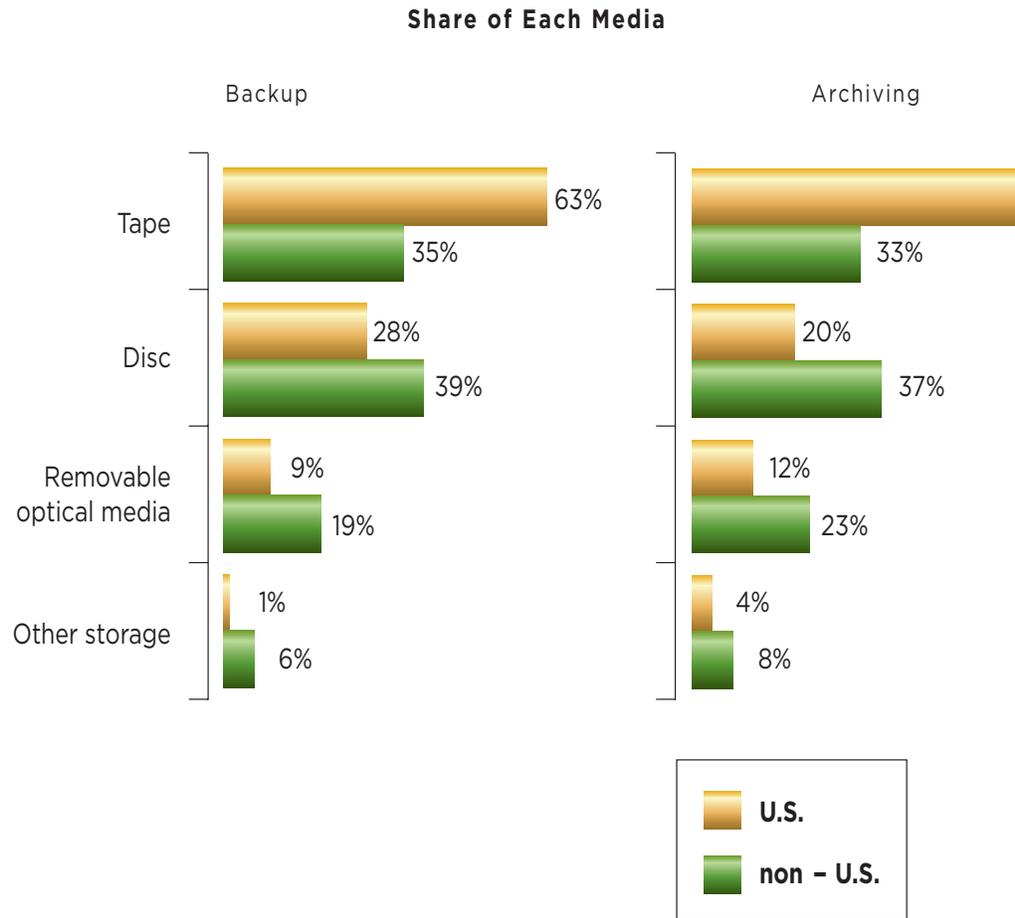
It is common for a data center to use both backup storage (in which recently generated data is copied to permit reloading) and archival storage. In fact, the majority of the survey respondents said they use the former, and about half said they use the latter.

Typically, storage, backup, and archiving require a mixed environment, with different types of systems and products from multiple vendors. For instance, for backup and archiving, organizations worldwide use a combination of tape, disk-based systems, and optical media.

U.S. respondents noted that they currently rely on tape to back up and archive most of their data. (See graph on page 26.) In contrast, their non-U.S. counterparts said they are relying on disk-based systems and tape fairly equally for backup and archival storage.

Disks Make Inroads in Backup and Archival Storage

A large percentage of backup and archival data resides on tape today, but many say usage of disk-based systems is increasing rapidly.



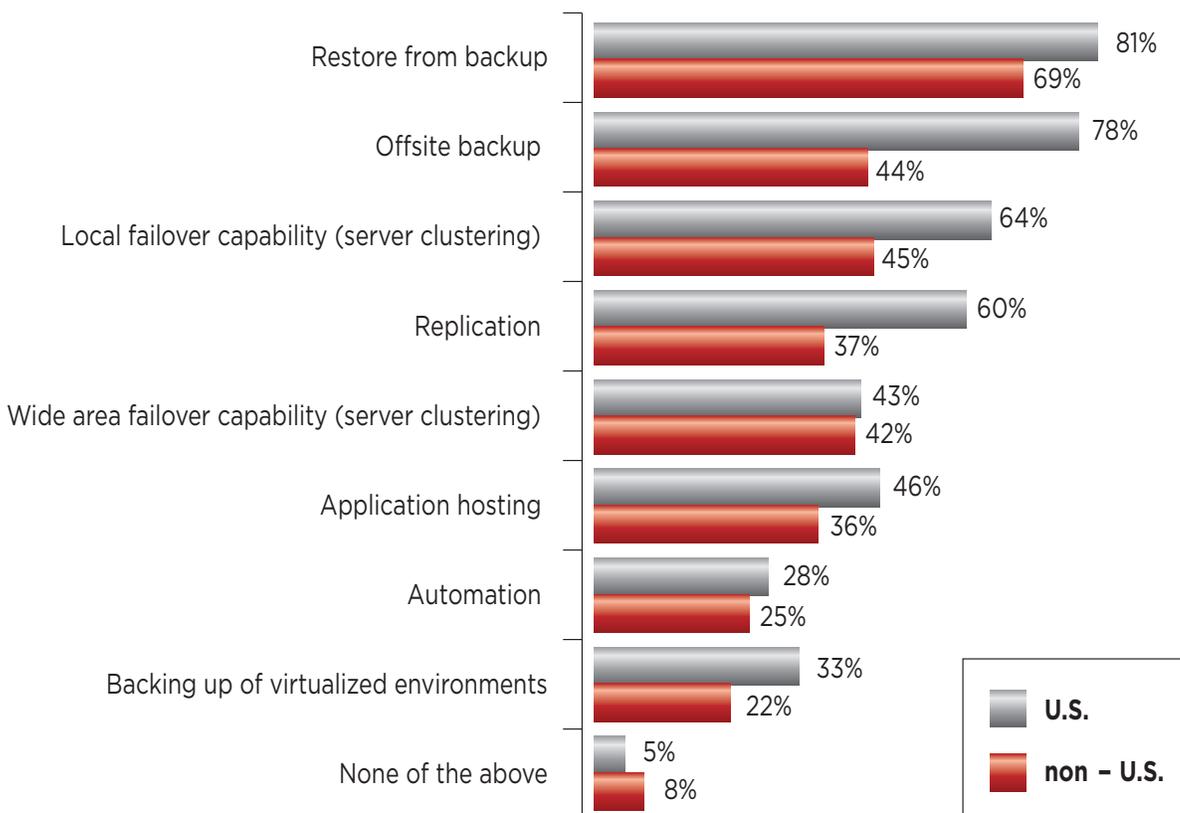
Roughly 45 percent of all survey respondents said disk-based backup and archiving are experiencing the greatest increase in usage. Almost the same percentage of U.S. respondents said tape was doing so. Interestingly, about one fifth of non-U.S. respondents said optical disk was experiencing the greatest increase in usage.

Disaster Recovery

When it comes to managing disaster recovery and high-availability plans, companies use a variety of technologies. The most common approach is to restore a system or data from a backup. Other frequently used methods include relying on an offsite backup, local failover to a new server, and replication.

High-Availability Solutions of Choice

Data center managers use a variety of methods to recover from an outage and ensure high availability.



Automation: Patch Management

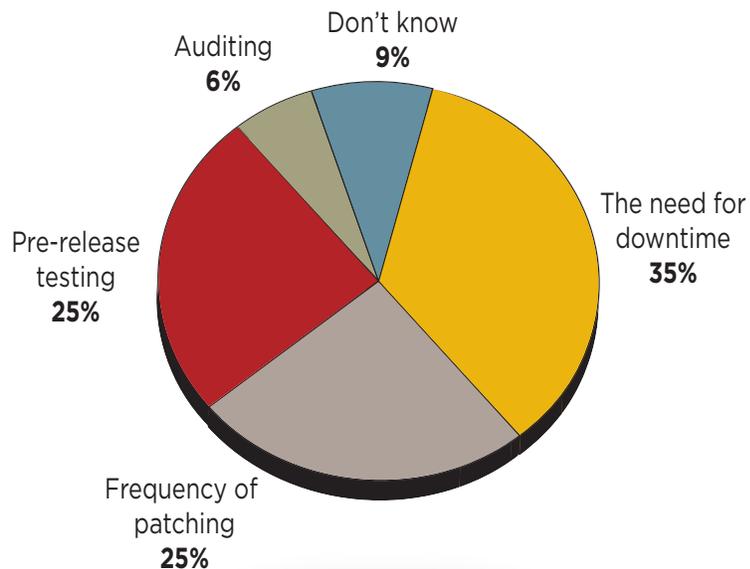
One area where data center managers can use help is in dealing with the repetitive and frequently occurring task of patch management.

Respondents said they have to patch their Windows-based servers an average of 7.2 times a quarter (about 29 times per year), and they must patch their Linux- and Unix-based servers about 4.7 times per quarter (19 times per year).

When you take into consideration the fact that many of the Web, messaging, and database applications that run on these servers must also be patched, it is easy to understand why managers are seeking help simply to deploy patches. As a result, many data center managers are automating their patch management procedures.

However, solutions are not so easy to come by. Patch management is fraught with problems. Focus group members cited a number of issues here. Some indicated that in their compliant and quality-assured software environments, they need to test every patch before applying it. Others mentioned that patches often interfere with some of their home-grown and third-party commercial applications. About one in seven patches needs to be rolled back, according to the survey.

Patch Management Issues



These obstacles to efficient patch management likely contribute to the fact that 20 percent of U.S. and 35 percent of non-U.S. data center servers are not patch-compliant, according to the survey.

Outsourcing

One way to contain data center costs is to outsource particular tasks to a third party. But outsourcing is not for everyone.

Only 42 percent of U.S. managers surveyed said they are using outsourcing. In contrast, 61 percent of non-U.S. organizations surveyed are. Among the most common tasks outsourced by both U.S. and non-U.S. organizations are server maintenance, backups, storage management, archiving, and business continuity.

Server maintenance was the most common task outsourced, with 37 percent of non-U.S. companies and 23 percent of U.S. companies saying they did so. This was closely followed by backup, with 35 percent of non-U.S. and 20 percent of U.S. companies using an outsourcing partner.

In the focus groups, many of the non-U.S. participants expressed enthusiasm for outsourcing. Noting that they purchased much of their equipment and software through resellers or systems integrators, these managers explained that since they already had relationships with these third parties, they often offloaded some of the management tasks to them as well.

Another possible reason for this disparity is that many U.S. IT organizations simply have a larger budget and more staff. That was the opinion of one focus group attendee in New York. He also noted that for some tasks, it was simply faster for his staff to tackle a problem than to call in an outside group.

Still, when U.S. organizations do decide to outsource, they outsource roughly the same number (three) of tasks as their counterparts in other countries.

All organizations tend to outsource for similar reasons. Specifically, among those that do outsource, about 40 percent of both U.S. and non-U.S. respondents said they outsource because it's less expensive than doing the tasks themselves.

In addition, outsourcing frees up a data center's staff to do other chores. This factor seemed more important to U.S. companies, as 42 percent said that was the reason they outsourced. Fewer non-U.S. companies gave that as their reason for outsourcing.

For some companies, outsourcing might help overcome staffing issues. Many managers expressed concerns about finding qualified staff. (See Issue 3: Staffing.) If a manager cannot find someone with the right skills, outsourcing can fill the stopgap until a suitable person is found. Also, about 27 percent of non-U.S. managers who outsource said they did so to increase their current staffs' access to specialized skills. Only 8 percent of U.S. respondents said this was a reason they used outsourcing.

Regional Variations

Data center managers from around the world are facing very similar conditions. Most must deliver high levels of IT service and availability to coincide with their organizations' global reach. As many have operations around the world, downtime must be kept to a minimum even for applications that traditionally have not been considered mission-critical such as email or Web applications.

However, while many of the challenges are the same, there are regional differences in how managers are addressing these problems.

Cost Containment Strategies: Regional Differences at a Glance

	U.S.	ASIA-PACIFIC AND JAPAN	EUROPE
SERVER CONSOLIDATION	VERY PREVALENT	COMPARABLE TO U.S.	LESS INTEREST THAN U.S. PEERS
SERVER VIRTUALIZATION	VERY PREVALENT	LOW ADOPTION	LOW ADOPTION
OUTSOURCING	OCCASIONAL USE	MORE COMMON THAN U.S.	OCCASIONAL USE
AUTOMATION OF ROUTINE TASKS	MODEST INTEREST	SIGNIFICANT INTEREST	SIGNIFICANT INTEREST
STAFFING ISSUES	MODERATE ISSUE	SIGNIFICANT ISSUE	MODERATE ISSUE
USE OF OPTICAL STORAGE	RELATIVELY LOW	RELATIVELY HIGH	RELATIVELY HIGH

Asia-Pacific and Japan (APJ)

When looking at regional variations in this study, the most telling point that defines the Asia-Pacific and Japan (APJ) region is the data center staffing issue. More than half of the respondents from this region said they were understaffed and another four percent said they were extremely understaffed.

There were a number of contributing factors to this finding. APJ managers said they had a significantly harder time finding qualified staff. They had more trouble retaining staff. And they have a bigger problem than their international peers when it came to losing staff through retirement.

So what are they doing to address this staffing problem?

For one, APJ managers rely on outsourcing more than their peers. The study found that they typically outsource about twice as much of their data center operations as their counterparts in Europe and about three times as much as U.S. managers.

The primary functions they outsource include backup, server maintenance, storage management, and business continuity. This follows logically, as these operations are very labor-intensive. If a company with a staffing shortage could offload these chores for its own staff, its employees would be able to focus on other tasks that are of more strategic value to the organization.

This staffing issue might also explain some choices in cost containment strategies and other IT operational areas.

For instance, the survey found that U.S. companies rely more heavily on tape for backup, while disk-based systems constitute a higher proportion of APJ organizations' equipment in this area. Again, this makes sense from the staffing standpoint. Tapes, even tape libraries, still require more manual work to perform backups and restore files and systems. Disk-based backup systems provide more automation.

Optical storage is used by nearly a quarter of APJ and European regions' organizations for backup and archiving. Percentage-wise, that is more than twice the usage rate of U.S. companies.

One other regional difference that stood out was the adoption of server virtualization. While APJ companies had about the same level of interest in server consolidation, only about half the APJ managers (compared to the percentage of U.S. managers) were considering or using virtualization.

There are a couple of possible reasons for this disparity. In the United States, VMware is the dominant choice for server and application virtualization efforts. Outside the United States, a higher percentage rely more heavily on solutions from Microsoft. (Solutions from IBM, HP, and others are being used in about the same proportion around the world.)

Some have suggested that VMware's marketing efforts have not extended to all regions as effectively as they have in the United States. Others have noted that native language support is not yet available in some regions.

Those that would use Microsoft for server virtualization might also be waiting for the more robust virtualization features that will be part of next release of the Windows Server operating system.

Europe

Managers in Europe typically had similar approaches to dealing with data center operational needs as U.S. managers. They did not deviate as much as their APJ peers.

However, there are some differences.

Staffing issues for European managers are on a par with those in the United States and are not as extreme as those faced in the APJ region.

European companies use outsourcing at a somewhat higher rate than in the United States. They rely on outsourcing even more heavily than their U.S. peers for functions like backup, archiving, and automation of routine tasks.

Interestingly, while the main drivers for outsourcing are about the same around the world, a significantly higher percentage of European managers see it as a way to expose their staff to specialized skills.

Another notable difference is that a higher percentage sees reduction in headcount as a way to contain costs. In order to do that, they are counting on the automation of routine tasks to keep costs down, considering automation in higher percentages than their peers.

Most tellingly, almost 50 percent more European managers see reducing data center complexity as a key to cutting costs. This was borne out in the focus groups, as several London participants mentioned the need for standards and standardization.

Looking to the Future

The qualitative part of the study revealed some common themes as to how managers think conditions will change and how they will cope with these changes.

Many felt that since most companies are going global, one system will service different locations, which will increase the load on the data centers. This theme was pervasive. All operations are moving to becoming 24 x 7. This adds complexity since more robust recovery and availability solutions must be used to ensure 24-hour-a-day access to applications.

Companies will be taking different approaches to cope with the continued complexity of their data centers. For instance, some are looking to standards to help. To that end, several focus group attendees and interviewees mentioned adopting ITIL methodologies. Additionally, some noted that in the next five years they would be going for certifications such as TIA-942 and ISO 20000 to help with their overall data center operations. Along those lines, some said they will look for staff with Data Center Foundation Certification and Certified Data Center Professional certifications.

As the complexity grows and new technologies are introduced into data centers, managers said this will add to their staffing woes. Companies are already having trouble finding qualified staff. To keep up technology changes, many managers felt employees would have to gain knowledge of these technologies to properly support the data center operations.

Some saw the need for increased skills in specific areas, such as Fibre Channel technology, storage devices, and providing Software as a Service. Others believe there will be a need for more skills in data security and wide-area networking.

The bottom line is that most managers believe the complexity and service level demands will continue to increase. One interviewee from India summed up the general feeling of the managers saying: "There will not be any improvement; these challenges will get even more complex."