The Total Economic Impact™ Of NetApp’s Storage Solutions For Server Virtualization

Multicompany Analysis

Project Director: Bob Cormier, Forrester Consulting
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Executive Summary

In early 2009, Forrester Research started work on a research project commissioned by NetApp that focused on examining the potential return on investment (ROI) enterprises may realize by adopting NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform.

This study highlights the benefits and costs of deploying NetApp’s storage solutions for server virtualization across the enterprise of a sample Organization (see Appendix A for a description of the sample Organization). The findings in this study are in large part based on in-depth interviews conducted by Forrester with seven organizations currently using NetApp’s storage solutions for server virtualization. The study examines the estimated ROI for the sample Organization and presents the aggregate findings derived from the interview and analysis process as well as our independent research.

The study found that for our sample Organization, the NetApp storage solutions for server virtualization provided quantifiable benefits and savings in the following areas:

- Reduction in storage hardware and software costs — using data deduplication, thin provisioning, and FlexClone technologies.
- Improvements in backup and recovery processes.
- Savings in media, hardware and software associated with centralized backup.
- Labor savings for storage administration.

In addition, most interviewed organizations indicated that their original investment in NetApp’s storage solutions for server virtualization could provide them with the flexibility and agility to take advantage of future savings that NetApp disaster recovery replication technology could bring to their organizations.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact on their organizations of NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform. Forrester’s aim is to show all calculations and assumptions used in the analysis. Readers should use this study to better understand and communicate a business case for investing in NetApp’s storage solutions for server virtualization.

Methodology

NetApp selected Forrester for this project because of our industry expertise in server consolidation and virtualization, storage technologies, and Forrester’s Total Economic Impact™ (TEI) methodology. TEI not only measures costs and cost reduction (areas that are typically accounted for within IT) but also weighs the enabling value of a technology in increasing the effectiveness of overall business processes.

For this study, Forrester employed four fundamental elements of its TEI methodology in modeling NetApp’s storage solution for server virtualization:
2. Benefits to the entire organization.
3. Flexibility.
4. Risk.

Given the increasing sophistication that enterprises have regarding cost analyses related to IT investments, Forrester’s TEI methodology serves an extremely useful purpose by providing a complete picture of the total economic impact of purchase decisions. Please see Appendix B for additional information on the TEI methodology.

**Approach**
Forrester used a five-step approach for this study:

1. Forrester gathered data from existing Forrester research relative to NetApp’s storage solutions for server virtualization.
2. Forrester interviewed NetApp’s marketing, product management, and sales personnel to fully understand the potential (or intended) value proposition of its solutions.
3. Using knowledge of the NetApp solution, as well as input from existing Forrester research, a Forrester representative conducted in-depth discussions with seven of NetApp’s customers regarding their experiences with NetApp’s storage solutions for server virtualization.
4. Forrester constructed a financial model representative of data collected in the interviews.
5. Forrester created this study, which represents and examines the estimated value of the findings derived from the customer interview and analysis process and from Forrester’s independent research.

**Key Findings**
Table 1 represents a summary of the ROI the Organization expects to realize over a three-year period by deploying NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform.
Table 1: Three-Year Summary Financial Results — The Organization

<table>
<thead>
<tr>
<th>Summary financial results</th>
<th>Unadjusted (best-case)</th>
<th>Risk-adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROI</td>
<td>52%</td>
<td>37%</td>
</tr>
<tr>
<td>Payback period</td>
<td>Within 15 months</td>
<td>Within 18 months</td>
</tr>
<tr>
<td>Total costs (PV)</td>
<td>($437,818)</td>
<td>($437,818)</td>
</tr>
<tr>
<td>Total cost savings and benefits (PV)</td>
<td>($665,710)</td>
<td>($599,139)</td>
</tr>
<tr>
<td>Total (NPV)</td>
<td>$227,892</td>
<td>$161,321</td>
</tr>
</tbody>
</table>

Source: Forrester Research, Inc.

The three-year risk-adjusted total NPV (net present value) of $161,321 represents the net cost savings and benefits attributed to using the NetApp solution when compared with the costs of the Organization’s storage environment before consolidation and virtualization (see details below in the Costs, Benefits, Flexibility, and Risks sections). In addition, the risk-adjusted ROI was a very favorable 37%.

Table 1 illustrates the risk-adjusted cash flow for the sample Organization, based on data and characteristics obtained during the customer interview process. Forrester risk-adjusts these values to take into account the potential uncertainty that exists in estimating the costs and benefits of a technology investment. The risk-adjusted value is meant to provide a conservative estimate, incorporating any potential risk factors that may later affect the original cost and benefit estimates. For this study, Forrester applied a 10% risk adjustment — i.e., a reduction of 10% — to all benefits to reflect the risks. For a more in-depth explanation of risk and the risk adjustments used in this study, please see the Risk section.

The objective of this study is not to illustrate savings that other enterprises can obtain by deploying the NetApp solution but rather to identify savings that the interviewed customers experienced. These results can be used as a guide to allow other enterprises to determine the appropriate benefits for their particular environment.

Disclosures

The reader should be aware of the following:

- The study was commissioned by NetApp and delivered by the Forrester Consulting group.
- NetApp reviewed and provided feedback to Forrester, but Forrester maintained editorial control over the study and its findings and did not accept changes to the study that contradicted Forrester’s findings or obscured the meaning of the study.
- NetApp provided the customer names for the interviews.
- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the study to determine the appropriateness of an investment in NetApp’s storage solutions for server virtualization.

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About NetApp’s Storage Solutions For Server Virtualization And VMware

NetApp Storage Solutions For Server Virtualization

According to NetApp, its storage solutions for server virtualization complement the benefits provided to servers by VMware, enabling organizations to:

- Save up to 50% on storage power, cooling, and space and lower overall data center costs using thin provisioning and snapshot copies.
- Bring products, services, and projects to market faster with instant storage provisioning.
- Frequently and efficiently back up data with many recovery points using many space-efficient snapshot copies, each representing a potential rollback point.
- Provide self-service tools for virtual server administrators to schedule snapshot frequency and perform data restores in the event of system or user corruption or deletion.

Organizations may also experience a smooth transition to their storage infrastructure with NetApp’s specialized virtualization services including assessment, implementation, and management delivered by experienced, certified professionals, using proven methodologies and best practices.

VMware ESX Server

According to NetApp, VMware and its Virtual Infrastructure Suite (VI3) is comprised of products that help organizations deploy and manage highly available and dynamic data centers. The foundation of VI3 is ESX Server, the hypervisor or virtualization layer that allows a traditional physical server to be provisioned into multiple virtual machines. A key value of a virtual machine is that it acts just like a traditional server, thus requiring no or only minimal change to an application in order for it to operate within the virtual infrastructure. The hypervisor layer addresses one of the main goals of the legacy data center — maintain application isolation by running each application on its own server — yet ESX allows organizations to aggregate multiple virtual servers onto a single physical hosting platform.

Customer Interview Highlights

Forrester derived its conclusions in large part from information received in a series of in-depth interviews with executives and personnel at seven organizations currently using NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform. The following is a brief description of each of the interviewed organizations, all of which were promised anonymity:

1. An institute of science for one of the leading universities in the US whose server and storage needs have grown dramatically from 16 physical servers and 4 TB of disk to 100 physical servers, 30 virtual servers, and more than 200 TB of NetApp storage in the past
2.5 years. It has been using NetApp storage solutions for server virtualization in conjunction with VMware ESX Server for more than two years.

2. A leader in remote online data backup and managed data protection solutions including online data backup, disk-based recovery, high-availability, email archiving, and data life-cycle solutions. It has been using NetApp’s storage for eight months and has consolidated 40 physical servers onto three VMware ESX servers with 20 TBs of NetApp storage.

3. A 25-year-old leading medical device company developing and manufacturing less-invasive devices. It has been using NetApp’s storage solutions for server virtualization in conjunction with VMware for more than two years to eliminate 125 physical servers and replace them with 18 VMware ESX hosts with 180 TBs of NetApp storage.

4. A world leader in cosmetics, skin care, fragrance, and personal care products. It has been using NetApp’s storage solutions for server virtualization in conjunction with VMware for more than a year to eliminate 300 physical servers and replace them with 36 VMware ESX hosts with 35 TBs of NetApp storage.

5. A not-for-profit provider of government information technology and telecommunication solutions to a major US city and the surrounding county. It has been using NetApp’s storage solutions for server virtualization in conjunction with VMware for more than four years. It has more than 300 virtual servers running on 22 VMware ESX hosts accessing 275 TBs of NetApp storage across three data centers.

6. The central IT group of a large US city in the Northeast consisting of 40 employees who support the city and board of education’s IT needs. It has been using NetApp’s storage solutions for server virtualization in conjunction with VMware for more than nine months to eliminate 20 physical servers and replace them with four VMware ESX hosts using 13.2 TBs of NetApp storage.

7. The community college system of an East Coast state in the US supporting 23 colleges and more than 240,000 students. It has been using NetApp’s storage solutions for 18 months to establish an automated disaster recovery site that today uses 100 TBs of NetApp storage.

Sample Organization Description

The Organization is a $2 billion-plus multinational manufacturer and service provider headquartered in North America with operations in Europe and Asia. Prior to implementing NetApp’s storage solutions for server virtualization, it had 400 Intel X86 physical servers being used to run mission-critical applications such as eCommerce, email, and financials. The server population was a mix of Windows NT and Windows 2003 operating systems. The Organization recently made the strategic decision to implement server virtualization for 300 servers in the following categories: file, print, active directory, small database, Domain Name System (DNS), and Web servers. It has chosen to keep its large database and Microsoft Exchange infrastructure on physical servers. In addition, it wanted to virtualize its disaster recovery infrastructure sometime in the next two years.

Prior to implementing NetApp’s storage solutions for server virtualization, the Organization:

- Was using a Fibre Channel SAN.
- Backed up files to tape using a legacy tape-to-tape system.
• Recovered files from tape. In the event of a disaster, would have tapes shipped in from remote storage facility.

As with the organizations that Forrester interviewed, the sample Organization’s reasons for pursuing a server virtualization strategy were as follows:

1. **Consolidation.** Reduce the number of servers, reduce its storage footprint, use fewer network ports and consolidate to one storage vendor.

2. **Green IT.** Its data center was reaching its space, power, and cooling capacity, and the virtual server strategy is seen as a way to reduce power spending and avoid data center expansion costs.

3. **Higher availability.** The Organization wanted to focus on higher availability for its critical business applications through the use of VMware failover technologies.

4. **Disaster recovery.** To replace their tape-based backup and recovery systems with replication in about two years.

5. **Faster application deployment.** It wanted a more efficient way to deploy applications and patches.

6. **Reduce labor costs.** The storage solution needed to be easier to manage with fewer resources needed.

*The Sample Organization Chooses NetApp’s Storage Solutions For Server Virtualization*

Forrester assumes that the sample Organization had already purchased VMWare ESX software prior to investing in NetApp’s storage solutions for server virtualization, therefore the cost for VMWare is not included in this case study ROI analysis; however, we are listing the configuration below.

- VMware ESX software (investment already made by Organization):
  - vCenter.
  - VMotion.
  - High Availability.
  - Dynamic Resource Scheduler.
  - Virtual Consolidated Backup.
  - Site Recovery Manager.

The Organization contacted NetApp, its primary storage vendor, to purchase the following hardware, software, services, features, and functionalities (prices in bold):

• FAS3140A with 24 TB of raw capacity for primary storage (**$310,992**) (assumes initial use of 12 TB *after* deduplication and 25% annual growth thereafter, reaching 24 TB * at end of Year 3). Included in the price is:
  o iSCSI protocol.
  o SMVI (Snap Manager for Virtual Infrastructure).
  o SnapMirror software.
  o SnapRestore software.
  o Deduplication software.
  o FlexClone software.
  o Three-year SupportEdge Premium – 4-hour onsite support.

• FAS2050 with 20 TB of raw capacity as replication and backup target (**$103,326**) (assumes initial use of 10 TB *after* deduplication and 25% annual growth thereafter, reaching 20 TB * at end of Year 3). Included in the price is:
  o iSCSI protocol.
  o SnapMirror software.
  o SnapRestore software.
  o Deduplication software.
  o Three-year SupportEdge Premium - 4-hour onsite support.

• NetApp University training units (60) — system administration courses (**$4,500**).

*Note:* Without deduplication the *Organization* would need to buy an additional 44 TB of raw storage capacity (disk shelves and drives) for primary and backup storage at an incremental cost (or savings for this analysis) of $218,000.

**Assumptions:**

• Prior to implementing NetApp’s storage for virtualization solutions, the *Organization* had 400 X86 one- and two-socket servers and had plans to virtualize 300 of those running file, print, active directory, small database, Domain Name System (DNS), and Web servers.

• The *Organization*’s storage needs are expected to grow by 25% annually for the three years of this analysis, which Forrester sees as a reasonably conservative data growth rate.

• During the next 18 months, the *Organization* will replace 300 physical servers with 10 ESX host (virtual) servers (quad core servers with 512 MB of memory such as HP DL380 or IBM 3650 and quad port Ethernet HBAs) with a projected ratio of 30 virtual servers per physical server.
• The new future backup and disaster recovery plans will incorporate NetApp storage for virtualization solutions.

• Backup:
  o Before: primary storage backed up to tape with legacy tape-to-tape system.
  o After: backup using NetApp FAS2050 as replication and backup target.

• Disaster recovery:
  o Before: recovered from tape. Would have tapes shipped back in the event of a disaster.
  o Future (two years): immediate failover to disaster recovery site using NetApp FAS2050 - see Flexibility section below).

**TEI Framework**

*Introduction*

From the information gathered in the in-depth customer interviews, Forrester has constructed a TEI framework for those organizations considering implementation of NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

*Sample Organization*

Based on the interviews with the seven existing customers that NetApp provided, Forrester constructed a TEI framework, a sample *Organization*, and an associated ROI analysis that illustrates the areas affected financially. The sample *Organization* that Forrester synthesized from these results is described above and in Appendix A.

*Framework Assumptions*

Table 2 lists the discount rate used in the present value (PV) and net present value (NPV) calculations, the time horizon used for the financial modeling, and other costs.

**Table 2: General Assumptions**

<table>
<thead>
<tr>
<th>General assumptions</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate used to compute NPV</td>
<td>10%</td>
</tr>
<tr>
<td>Length of analysis</td>
<td>Three years</td>
</tr>
<tr>
<td>Annual fully loaded cost of a storage administrator</td>
<td>$110,000</td>
</tr>
</tbody>
</table>

Source: Forrester Research, Inc.
Costs

Costs are an important part of the TEI model. Costs, or IT impact, are calculated as a change in costs primarily for IT as a result of the introduction of the technology to the Organization. Therefore, the introduction of NetApp’s solution affects IT budgets negatively with the purchase of the solution; it also affects the Organization positively, in terms of the potential cost savings and efficiencies created (see the Benefits And Savings section below).

The impact of cost is accrued in two different areas described below: NetApp solution costs (see pages 9 and 10 for details and pricing) and the Organization’s internal preparation, planning, and migration costs, which all together amount to $437,818.

Costs For The NetApp Solution: $418,818

- See configuration details and pricing starting on page 9.
- NetApp pricing is based on normal and average discounts off NetApp’s list price as of April 2009.

Cost For Internal Preparation And Planning Labor: $4,000

- A readiness assessment that looks at costs, benefits, and risks along with detailed planning is essential for a successful storage consolidation initiative for server virtualization. Based on interviews with current NetApp customers, our Organization required one full-time equivalent (FTE) storage administrator to spend approximately two weeks of his time — before and during implementation — planning and testing methods (e.g., VMotion) of migrating data from legacy storage to the virtual storage environment.

Cost For Internal Labor For Data Migration: $15,000

- Internal labor associated with the actual data migration from the previous storage system to the NetApp array. Forrester estimates the time and effort to be equal to eight weeks of effort, or $15,000.

Benefits And Savings: Quantified

In addition to the costs associated with the NetApp solution, there were positive IT cost savings and benefits with NetApp’s storage solutions for server virtualization. Interviewed organizations, however, were challenged with segregating the benefits from server virtualization with the benefits from NetApp’s storage solutions. With Forrester’s assistance, a majority of the organizations agreed that the NetApp quantified benefits focused around: reduced storage hardware and software costs through data deduplication, FlexClone, and thin provisioning technologies, improvements in the backup and recovery processes, savings in media and software associated with centralized backup, and storage administration labor savings.

Based on an analysis of the interviews with the participating customers, we could quantify the following benefits as a result of implementing NetApp’s storage solutions for server virtualization.

Cost Savings — Reduction In Storage Hardware And Software Costs: $254,000

The interviewed organizations reported using combinations of the three NetApp technologies, listed below, that reduced their storage costs. For our sample Organization, we assumed that during a six-month period, our storage administrators became aware of and fully proficient at all three technologies. The interviewed customers using these technologies reported significant storage cost savings averaging 60% to 70% in their production VMware environments.
• **Data deduplication.** NetApp provides the benefit of sharing identical data among multiple virtual machines that reside on disk storage through its data deduplication technology, resulting in the contents of virtual machines being reduced to a single copy per data store. Several customers reported using NetApp’s deduplication across all storage protocols (NFS, FC, and iSCSI) supported by VMware and saving 50% in future storage costs. Our Organization was able to avoid purchasing 44 TB of primary and back-up storage (disk shelves and drives) at an initial cost avoidance of $218,000.

The interviewed customers reported savings of another 15% in future primary storage hardware using the combination of NetApp thin provisioning and FlexClone features, although it was difficult for these customers to segregate the savings between the two. Our Organization was able to avoid purchasing another 7.2 TB of storage hardware (disk shelves and drives) over three years at an average cost of $5,000 per terabyte or $36,000 ($12,000 savings annually). These features are described below.

• **Thin provisioning.** The seven interviewed customers each described a traditional (pre-virtualization) environment where server administrators would overprovision storage to avoid running out and to avoid the downtime related to expanding the provisioned storage. NetApp’s thin provisioning feature provides storage on demand by treating storage as a shared resource that is consumed only when individual virtual machines require it. This sharing increases the total utilization rate of storage by eliminating the unused but provisioned areas of storage that are associated with traditional storage.

Thin provisioning and data deduplication are mutually inclusive features designed to reduce the need for more storage by increasing the utilization rates of existing storage. Thin provisioning allows one to only consume on demand, with deduplication removing any redundancy subsequently added to the array. Both deduplication and thin provisioning can be enabled or disabled on a data object basis.

• **FlexClone.** With NetApp’s FlexClone feature, any storage object (file, LUN, or volume) can be cloned and made available for access. With FlexClone, common storage blocks between the clone and the original data set consume no additional physical storage space. Clones can increase in size as unique data is added to them.

Should any of this cloned data become redundant, data deduplication technology will remove the redundancies, returning the previously used storage back to the pool for reuse later.

**Cost Savings — Improvements In Backup And Recovery Processes: $528,000**

Several interviewed customers reported improvements in their backup and recovery processes. Our sample Organization originally considered using its legacy tape-to-tape system to back up its VMware data. However, it soon realized that as storage requirements continued to grow at 25% annually, it would not be able to complete the tape-to-tape backup process within an appropriate backup window. The Organization chose to purchase a NetApp FAS2050 device as its replication and backup target and to use NetApp Snapshot technology to perform local backups. Snapshot will create point-in-time copies of file systems for use as backup in significantly less time than the previous tape-to-tape system, reducing the future need for media and software associated with tape backup processes. There were two specific savings categories identified with our Organizations improvement in its backup and recovery processes:

1. **Media And Software Associated With Centralized Backup: $198,000**

   After the storage needs of the eliminated servers (file, print, active directory, small database, DNS, and Web) are consolidated onto NetApp storage systems and backed-up...
to the FAS2050 device using Snapshot, there will no longer be a need for the legacy tape-to-tape systems including equipment, software, and media costs. Instead of having a backup solution for each of the original 300 (now virtualized) servers, our Organization now has only one storage system (FAS3140A) from which to perform data backups. In addition, the Organization did not have to grow its legacy tape-to-tape system and offsite facilities avoiding incremental hardware, software, media and storage costs. The sample Organization was able to save $66,000 annually in media (tape), backup tape drives, software costs, and offsite tape storage.

The total three-year cost savings associated with centralized backup is $198,000.

2. **Labor savings for backup and recovery administration: $330,000**

Several interviewed organizations highlighted savings in the time it takes for administrators to restore data from backups when using the NetApp solution. Prior to deploying NetApp’s storage solutions for server consolidation, several organizations found that the time to restore from backup tapes was significant, both in terms of inefficient use of IT resources and end user downtime. Based on input from the interviewed customers, we estimate that the IT administrative savings resulting from improving the labor efficiencies of backup and restore for our Organization will be one FTE or $110,000 annually, based on a fully burdened storage administrator’s salary of $110,000 annually.

The total three-year cost savings associated with simplification of backup and recovery tasks is $330,000.

Table 3: Total Benefits And Cost Savings — The Organization (Non-Risk-Adjusted)

<table>
<thead>
<tr>
<th>Total benefits and cost savings</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in storage hardware and software costs – using data deduplication</td>
<td>$218,000</td>
<td>$0</td>
<td>$0</td>
<td>$218,000</td>
<td>$198,182</td>
</tr>
<tr>
<td>Reduction in storage hardware and software costs – using thin provisioning and FlexClone</td>
<td>$12,000</td>
<td>$12,000</td>
<td>$12,000</td>
<td>$36,000</td>
<td>$29,842</td>
</tr>
<tr>
<td>Media and software associated with centralized backup</td>
<td>$66,000</td>
<td>$66,000</td>
<td>$66,000</td>
<td>$198,000</td>
<td>$164,132</td>
</tr>
<tr>
<td>Labor savings for backup and recovery storage administration</td>
<td>$110,000</td>
<td>$110,000</td>
<td>$110,000</td>
<td>$330,000</td>
<td>$273,554</td>
</tr>
<tr>
<td>Total benefits and cost savings</td>
<td>$406,000</td>
<td>$188,000</td>
<td>$188,000</td>
<td>$782,000</td>
<td>$665,710</td>
</tr>
</tbody>
</table>

Source: Forrester Research, Inc.
Benefits: Unquantified

The interviewed customers identified the following additional benefits of using NetApp’s storage solutions for server virtualization, but they were not able to quantify the benefits at the present time:

- Most of the interviewed customers acknowledged savings in power and cooling costs as a result of server virtualization and storage consolidation onto NetApp hardware. However, savings dollars could not be specifically apportioned to the NetApp storage because of legacy server use of direct-attached storage.

- Each of the interviewed customers reported that they were able to deploy and provision new applications up to four weeks faster with VMware ESX servers and NetApp’s storage solutions for server virtualization.

Risk

Risk-adjusted and non-risk-adjusted ROI are both discussed in this study. The Organization’s individual costs and benefits are quoted in non-risk-adjusted (best-case) terms and before risk adjustments are made. The assessment of risk provides a range of possible outcomes based on the risks associated with IT projects in general and specific risks relative to NetApp’s storage solutions for server virtualization projects. In our research, we discovered that implementing the NetApp solutions was a relatively low-risk endeavor if organizations took the time to thoroughly plan the server virtualization and storage transition process.

TEI uses risk factors to widen the possible outcomes of the costs and benefits (and resulting savings) associated with a project. As the future cannot be accurately predicted, there is risk inherent in any project. TEI captures risk in the form of risks-to-benefits and risks-to-costs.

Measurement of risk is a way of incorporating the levels of confidence and uncertainty regarding the cost and benefit estimates of a given investment. Higher confidence that the cost and benefit estimates will be met implies that the level of risk is lower, and the variation between the risk-adjusted and non-risk-adjusted outcomes is minimized.

Forrester considered the following general risks in this study:

- A lack of organizational discipline in creating processes and procedures to best take advantage of the benefits.

- A lack of appropriate training for the storage administrators who will be responsible for optimizing the full benefit potential of storage consolidation and taking advantage of the future simplification of backup and recovery tasks.

- Failures to reduce, transfer, or redeploy IT support headcount made redundant by deploying storage solutions for server virtualization.

- The possibility that the benefits will not be measured and quantified in the future; as a result, no TEI benefit would be captured and acknowledged.

- Internal inertia, conflicting priorities, and turnover, reducing an organization’s ability to achieve the benefits.

- Once consolidated, having fewer points of failure in storage environment will put significantly more data at risk.
The following risk associated with NetApp storage solutions for server virtualization was considered in this study:

- The inability of the \textit{Organization} to find, train, and retain administrators fluent in technologies such as VMware and NetApp’s Data ONTAP 7G operating system, to take full advantage of the benefits outlined in this study.

For this study, Forrester applied a 10\% risk adjustment — \textit{i.e.}, a reduction of 10\% — to all benefits to reflect the risks listed above. We have not risk-adjusted costs, as these were primarily fixed quotes from NetApp.

Table 3 represents the total costs, benefits, and cost savings (risk-adjusted by 10\%) of implementing NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform.

\textbf{Table 4: Total Benefits And Cost Savings — The \textit{Organization} (Risk-Adjusted)}

<table>
<thead>
<tr>
<th>Total benefits and cost savings</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in storage hardware and software costs – using data deduplication</td>
<td>$196,200</td>
<td>$0</td>
<td>$0</td>
<td>$196,200</td>
<td>$178,364</td>
</tr>
<tr>
<td>Reduction in storage hardware and software costs – using thin provisioning and FlexClone</td>
<td>$10,800</td>
<td>$10,800</td>
<td>$10,800</td>
<td>$32,400</td>
<td>$26,858</td>
</tr>
<tr>
<td>Media and software associated with centralized backup</td>
<td>$59,400</td>
<td>$59,400</td>
<td>$59,400</td>
<td>$178,200</td>
<td>$147,719</td>
</tr>
<tr>
<td>Labor savings for backup and recovery storage administration</td>
<td>$99,000</td>
<td>$99,000</td>
<td>$99,000</td>
<td>$297,000</td>
<td>$246,198</td>
</tr>
<tr>
<td>Total benefits and cost savings</td>
<td>$365,400</td>
<td>$169,200</td>
<td>$169,200</td>
<td>$703,800</td>
<td>$599,139</td>
</tr>
</tbody>
</table>

Source: Forrester Research, Inc.

If a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed as the risks that threaten the project have been taken into consideration and quantified. The risk-adjusted numbers should be taken as “realistic” expectations, as they represent the expected value considering risk. Assuming normal success at mitigating risk, the risk-adjusted numbers should more closely reflect the expected outcome of the investment.
Flexibility

Flexibility, as defined by TEI, represents investing in additional capacity or agility that can be turned into benefit for some future additional investment. We believe organizations that invest in NetApp’s storage solutions for server virtualization lay the groundwork to take advantage of migrating to a virtualized disaster recovery environment. For our Organization, virtualization is the future foundation to enhance and simplify disaster recovery and high availability.

Over the next 18 months, our Organization will be putting mission-critical applications on virtual machines and with this; disaster recovery becomes a more important issue. The limitations of tape will cause difficulty in a disaster recovery situation because of tape device data transfer speeds, and the physical distance between a primary data center and the Organization’s disaster recovery site.

Interviewed customers expressed an interest or the intent to take advantage of the option to use NetApp SnapMirror replication technology along with VMware’s Site Recovery Manager (SRM) to reduce the impact of a site disaster on the business. With SnapMirror technology, a virtual infrastructure can be replicated over the WAN to a remote data center. The future recovery of virtual machines affected by a site disaster can be completed in minutes instead of hours or days. In addition, SRM can leverage NetApp’s FlexClone technology to make immediate zero-cost clones of the DR data, allowing storage administrators to test their disaster recovery policies at any time without interrupting the production environment or disaster recovery replication. Our Organization also plans to leverage NetApp’s data deduplication technology in their disaster recovery plans.

Most of the seven organizations indicated that their original investment in NetApp’s storage solutions for server virtualization provided them with the flexibility and agility to take advantage of this disaster recovery “option” and the potential savings that a virtualized disaster recovery environment can bring to their organizations. At present, only three of the customers Forrester interviewed were currently taking advantage of VMware’s Site Recovery Manager and SnapMirror technologies; therefore, this study will not attempt to quantify its benefits. However, we encourage the reader to learn more about these technologies to determine the potential quantifiable benefits within their organizations.

The value of flexibility is clearly unique to each organization, and the willingness to measure its value varies from organization to organization. For the purpose of this analysis, we have assumed that the Organization sees the future value in being able to reduce future backup storage acquisition costs or achieve longer intervals between storage capacity upgrades using deduplication. The value of the option (when calculated) is based on the Black-Scholes Option Pricing formula. (For additional information regarding the flexibility calculation, please see Appendix B.)

TEI Framework: Summary

Considering the financial framework constructed above, the results of the Costs, Benefits, Risk, and Flexibility sections using the representative numbers can be used to determine a return on investment, net present value, and payback period.

Table 5 below shows the summarized risk-adjusted values, applying the risk-adjustment method indicated in the Risk section, which was to apply a 10% risk adjustment — i.e., a reduction of 10% — to all benefits to reflect the risks listed above. No risk adjustments were made to the costs, as these represented fixed quotes from NetApp or internal planning costs.

It is important to note that the values used throughout the TEI framework are based on in-depth interviews with seven organizations and the resulting sample Organization built by Forrester. Forrester makes no assumptions as to the potential return that other organizations will receive within their own environment. Forrester strongly advises that readers use their own estimates within
the framework provided in this study to determine the expected financial impact of implementing NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform.

Key Findings

Table 5 represents a summary of the risk-adjusted costs, benefits, and ROI that the Organization expects to realize over a three-year period by deploying NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform.

Table 5: Sample Organization Costs, Benefits, And ROI, (Risk-Adjusted)

<table>
<thead>
<tr>
<th></th>
<th>Initial cost</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
<th>NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total costs</td>
<td>($437,818)</td>
<td>($0)</td>
<td>($0)</td>
<td>($0)</td>
<td>($437,818)</td>
<td>($437,818)</td>
</tr>
<tr>
<td>Total benefits</td>
<td>$0</td>
<td>$365,400</td>
<td>$169,200</td>
<td>$169,200</td>
<td>$703,800</td>
<td>$599,139</td>
</tr>
<tr>
<td>Total</td>
<td>($437,818)</td>
<td>$365,400</td>
<td>$169,200</td>
<td>$169,200</td>
<td>$265,982</td>
<td>$161,321</td>
</tr>
<tr>
<td>Return on investment</td>
<td>37%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payback period</td>
<td>18 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Forrester Research, Inc.

The three-year, risk-adjusted total NPV (net present value) of $161,321 represents the net cost savings and benefits attributed to using the NetApp storage solution for server virtualization when compared with the costs of the Organization’s legacy server environment (see details above in the Costs, Benefits, Flexibility, and Risks section). In addition, the risk-adjusted ROI was a very favorable 37%.

Study Conclusions

As the data in this study indicates, NetApp’s storage solutions for server virtualization have the potential to provide a good return on investment. In addition, the risk-adjusted ROI of 37%, along with an 18 month payback period (breakeven point), raises confidence that the investment is likely to succeed, as the risks that may threaten the project have already been taken into consideration and quantified. In this study, risks have been modeled conservatively in the hopes of showing worst-case expectations.

A successful, well-planned implementation will allow benefits and cost savings to accrue to the Organization in the following areas:

- Reduction in storage hardware and software costs — using data deduplication, thin provisioning, and FlexClone technologies.
- Improvements in backup and recovery processes.
- Savings in media and software associated with centralized backup.
• Labor savings for storage administration.

In addition, most interviewed organizations indicated that their original investment in NetApp’s storage solutions for server virtualization could provide them with the flexibility and agility to take advantage of the future savings that NetApp disaster recovery replication technology could bring to their organizations.

Organizations that are likely to achieve a similar ROI have the following characteristics:

• Midsize to large organizations with a pre- or post-virtualization environment of multiple servers that are proving difficult to manage and maintain.

• Organizations where the costs of pre-virtualization server infrastructure (servers, storage, networks) continue to increase, sacrificing new investment opportunities.

• Organizations that are large enough to have distinctly delineated IT administration roles, i.e., system, storage, network.

• Interest in adoption of a disk-to-disk backup strategy environment either before or after implementing NetApp’s primary storage solutions.

• An IT staff with the requisite skills to manage virtual server and storage environments, including knowledge of VMware’s ESX server and virtualization platform, as well as NetApp’s Data ONTAP 7G operating system.

For our Organization, NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform carried a low level of risk, a positive 37% risk-adjusted ROI, and an 18 month horizon to recoup the investment.

We make no assumptions regarding the effects of NetApp’s storage solutions for server virtualization in conjunction with VMware’s ESX server and virtualization platform at other organizations. This study examines the potential impact attributable to the seven organizations that participated in our examination and applies the common costs and benefits to a representative sample Organization. The underlying objective of this document is to provide guidance to technology decision-makers seeking to identify areas where value can potentially be created based on using NetApp’s storage solutions for server virtualization.
Appendix A: Sample Organization Description

The Organization is a $2 billion-plus multinational manufacturer and service provider headquartered in North America with operations in Europe and Asia. Prior to implementing NetApp’s storage solutions for server virtualization, it had 400 Intel X86 physical servers being used to run mission-critical applications such as eCommerce, email, and financials. The server population was a mix of Windows NT and Windows 2003 operating systems. The Organization recently made the strategic decision to implement server virtualization for 300 servers in the following categories: file, print, active directory, small database, Domain Name System (DNS), and Web servers. It has chosen to keep its large database and Microsoft Exchange infrastructure on physical servers. In addition it wanted to virtualize its disaster recovery infrastructure sometime in the next two years.

Prior to implementing NetApp’s storage solutions for server virtualization the Organization:

- Was using a Fibre Channel SAN.
- Backed up files to tape using a legacy tape-to-tape system.
- Recovered files from tape. In the event of a disaster, would have tapes shipped in from remote storage facility.

As with the NetApp customers interviewed by Forrester, the sample Organization’s high-level business objectives for pursuing a NetApp storage for server virtualization strategy were as follows:

1. **Cost reduction.** It wanted to reduce the time and money spent on managing its servers and associated storage.
2. **Support business needs.** It needed to have a more flexible and agile storage infrastructure to respond to the business needs faster.
3. **Disaster recovery.** It had insufficient disaster recovery plans and minimal coverage in the event of a disaster.

The sample Organization’s tactical goals and objectives for pursuing a NetApp storage for server virtualization strategy were as follows:

1. **Consolidation.** Reduce the number of servers, reduce its storage footprint, and consolidate to one storage vendor.
2. **Green IT.** Its data center was reaching its space, power, and cooling capacity.
3. **Higher availability.** The Organization wanted to focus on higher availability for its critical business applications.
4. **Disaster recovery.** To replace its tape-based backup and recovery systems with replication in about two years.
5. **Faster application deployment.** It wanted a more efficient way to deploy applications and patches.
6. **Reduce labor costs.** The storage solution needed to be easier to manage with fewer resources needed.

Forrester assumes that the sample *Organization* had already purchased VMWare ESX software *prior* to investing in NetApp’s storage solutions for server virtualization, therefore the cost for VMware is not included in this case study ROI analysis; however, we are listing the configuration below.

- VMware ESX software with:
  - vCenter.
  - VMotion.
  - High Availability.
  - Dynamic Resource Scheduler.
  - Virtual Consolidated Backup.
  - Site Recovery Manager.

The *Organization* contacted NetApp, its primary storage vendor, to purchase the following hardware, software, services, features, and functionalities:

- **FAS3140A** with 24 TB of raw capacity for primary storage (assumes initial use of 12 TB *after* deduplication and 25% annual growth thereafter, reaching 24 TB at end of Year 3). Configuration includes:
  - iSCSI protocol.
  - SMVI (Snap Manager for Virtual Infrastructure).
  - SnapMirror software.
  - SnapRestore software.
  - Deduplication software.
  - FlexClone software.
  - Three-year SupportEdge Premium – 4-hour onsite support.

- **FAS2050** with 20 TB of raw capacity as replication and backup target (assumes initial use of 10 TB *after* deduplication and 25% annual growth thereafter, reaching 20 TB at end of Year 3). Configuration includes:
  - iSCSI protocol.
  - SnapMirror software.
The Total Economic Impact™ Of NetApp’s Storage Solutions For Server Virtualization

- SnapRestore software.
- Deduplication software.
- Three-year SupportEdge Premium – 4-hour onsite support.

- NetApp University training units (60) — system administration courses.

Assumptions:

- Prior to implementing NetApp’s storage for virtualization solutions, the Organization had 400 X86 one- and two-socket servers and had plans to virtualize 300 of those running file, print, active directory, small database, Domain Name System (DNS), and Web servers.

- The Organization’s storage needs are expected to grow by 25% annually for the three years of this analysis, which Forrester sees as a reasonably conservative data growth rate for such a firm.

- During the next 18 months, it will replace 300 physical servers with 10 ESX host (virtual) servers (quad core servers with 512 MB of memory such as HP DL380 or IBM 3650 and quad port Ethernet HBAs) with a projected ratio of 30 virtual servers per physical server.

- The new future backup and disaster recovery plans will incorporate NetApp storage for virtualization solutions.

- Backup
  - Before: primary storage backed up to tape with legacy tape-to-tape system.
  - After: backup using NetApp FAS2050 as replication and backup target.

- Disaster recovery
  - Before: recovered from tape. Would have tapes shipped back in the event of a disaster.
  - Future (two years): immediate failover to disaster recovery site using NetApp FAS2050. See Flexibility section above for more details.
Appendix B: Total Economic Impact™ Overview

Total Economic Impact is a methodology developed by Forrester Research that enhances an organization’s technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps organizations demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility. For the purpose of this analysis, the impact of flexibility was not quantified.

Benefits
Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

Costs
Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the forms of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

Risk
Risk measures the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: the likelihood that the cost and benefit estimates will meet the original projections and the likelihood that the estimates will be measured and tracked over time. TEI applies a probability density function known as “triangular distribution” to the values entered. At a minimum, three values are calculated to estimate the underlying range around each cost and benefit.

Flexibility
Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point in time. However, having the ability to capture that benefit has a present value that can be estimated. The flexibility component of TEI captures that value.
Appendix C: Glossary

**Discount rate:** The interest rate used in cash flow analysis to take into account the time value of money. Although the Federal Reserve Bank sets a discount rate, organizations often set a discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 12% for this analysis. Organizations typically use discount rates between 8% and 15% based on their current environment. Readers are urged to consult their organization to determine the most appropriate discount rate to use in their own environment.

**Net present value (NPV):** The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

**Present value (PV):** The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total net present value of cash flows.

**Payback period:** The breakeven point for an investment, or the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

**Return on investment (ROI):** A measure of a project’s expected return in percentage terms. ROI is calculated by dividing net benefits (benefits minus costs) by costs.

**A Note On Cash Flow Tables**

The following is a note on the cash flow tables used in this study (see the Example Table below). The initial investment column contains costs incurred at “time 0” or at the beginning of Year 1. Those costs are not discounted. All other cash flows in Years 1 through 3 are discounted using the discount rate shown in Table 2 at the end of the year. Present value (PV) calculations are calculated for each total cost and benefit estimate. Net present value (NPV) calculations are not calculated until the summary tables and are the sum of the initial investment and the discounted cash inflows and outflows in each year.

**Example Table**

<table>
<thead>
<tr>
<th>Category</th>
<th>Initial cost</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
</tr>
</thead>
</table>

Source: Forrester Research, Inc.
Appendix D: About The Project Manager

Bob Cormier  
Principal Consultant

Bob is a principal consultant for Forrester’s Total Economic Impact™ (TEI) service. He is a leading expert on deriving business value from technology investments specializing in advising clients on the TEI framework — services that help organizations understand the overall financial value of IT strategies and investments. He serves the following client roles:

- Bob serves CIO’s and their staffs as a trusted advisor to create consistent, repeatable and best practice processes to justify and add credibility to technology investments business cases, using Forrester’s TEI methodology.

- Bob serves Technology Product Management and Marketing professionals in their efforts to clearly articulate the unique value proposition of their solutions to prospects and customers using Forrester’s TEI methodology.

Bob has authored numerous TEI case studies for Forrester’s vendor clients. Bob has also delivered his acclaimed Justifying Technology Investments workshop to over 800 participants representing 400 organizations.

Bob has more than 25 years experience in the IT and consulting industries. Prior to joining Forrester, he held senior-level positions at two leading eBusiness consulting firms, ZEFER and Cambridge Technology Partners. Bob has successfully led company efforts to optimize financial, operational, and resource planning activities, incorporating leading-edge, professional service automation (PSA) applications and enterprise resource planning (ERP) systems. He has also held senior financial management positions at Digital Equipment and Anixter International.

During his career Bob has consulted with global users and vendors of IT and has been a frequent speaker at conferences, events and seminars.

Education

Bob earned an M.B.A. from Bentley University and a B.S. in business from the University of New Hampshire. As an adjunct professor, he has taught finance and economics courses for more than 10 years at Southern New Hampshire University and Daniel Webster College.