

A Forrester Total Economic Impact™ Study Prepared For VMware

Total Economic Impact Of VMware vSphere Virtualizing Mission-Critical Oracle Databases

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FORRESTER

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Executive Summary

In January 2011, VMware commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by virtualizing mission-critical Oracle databases on the VMware vSphere platform. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of VMware vSphere on their organizations.

vSphere Reduces Overall IT Management Costs

Our interviews with four existing customers and subsequent financial analysis found that these organizations achieved a number of benefits: some easily measured for this ROI study and others equally valuable that could not be quantified. These benefits fall into the following categories:

1. Improved IT infrastructure and database administrator productivity.
2. Avoided costs of purchasing new hardware.
3. Reduced power and cooling costs.
4. Data center space freed up for other uses.
5. User productivity increased through reduced planned and unplanned IT downtime.
6. Improved time-to-market of product and services IT delivers to business users.
7. Better business continuity and disaster recovery capabilities.
8. Better work experience for IT staff.
9. Potential reduction in number of Oracle licenses when an organization creates a new database directly in the virtualized environment.

To fully understand the potential impact on their organizations, readers should take into consideration all benefits, whether or not they are quantified in this study. To illustrate the financial impact of this investment in Table 1, we created a composite organization from the four companies interviewed. See Appendix A for a description of the composite organization.

Table 1

Composite Organization Three-Year Risk-Adjusted Sales Growth/ROI/TCO¹

ROI	Payback period	Total benefits (PV)	Total costs (PV)	Net present value (NPV)
888%	4 months	\$2,079,273	(\$210,398)	\$1,868,875

Source: Forrester Research, Inc.

- **Benefits.** The composite organization experienced the following benefits that represent those experienced by the interviewed companies: (The data in the parentheses provides the three-year risk-adjusted total benefits.)
 - **Hardware maintenance cost savings.** (\$709,324) This represents the reduction in hardware maintenance costs resulting from retiring hardware.
 - **Power and cooling cost savings.** (\$589,947) This represents the difference in power and cooling costs between the virtual environment and the prior physical architecture.
 - **Reduction in ongoing administrative cost.** (\$539,000) This represents the reduced time and effort of database administrators after virtualizing Oracle databases.
 - **Reduced downtime for end users.** (\$310,200) This represents an improvement in end user productivity through the reduction of planned and unplanned downtime incidents.
 - **Hardware refreshes cost avoidance.** (\$288,120) This represents the number of hardware refreshes that was eliminated as a result of deploying VMware vSphere.
 - **Disaster recovery cost avoidance.** (\$103,750) This represents the cost avoidance resulting from less unexpected failure when protecting critical applications and IT infrastructure against various causes of downtime.
 - **Data center space cost savings.** (\$15,680) This represents the reduction in data center space required to run the existing workloads after reducing the number of required physical servers due to virtualization.
 - **Improvement in time-to-market.** (did not quantify) This represents the improvement in time-to-market of applications that IT delivers to the business units, which makes end users efficient or speeds the creation of products or services that improves the bottom line.
 - **Reduction in Oracle licensing costs.** (did not quantify) This represents the reduction in number of Oracle licenses when an organization creates a new database directly in the virtualized environment.
- **Costs.** The composite organization experienced the following new (or additional) costs: (The data in the parentheses provides the three-year risk-adjusted total costs.)
 - **VMware software license and maintenance fees.** (\$74,138) This cost represents the investment in VMware licenses and their annual maintenance costs.
 - **Internal implementation costs.** (\$72,576) This category represents IT resources allocated to discovery, testing, and implementation.
 - **Third-party professional services fees.** (\$69,120) This represents the cost allocated to third-party services firms to assist with virtualization best practices when migrating the business and mission-critical databases.

Factors Affecting Benefits And Costs

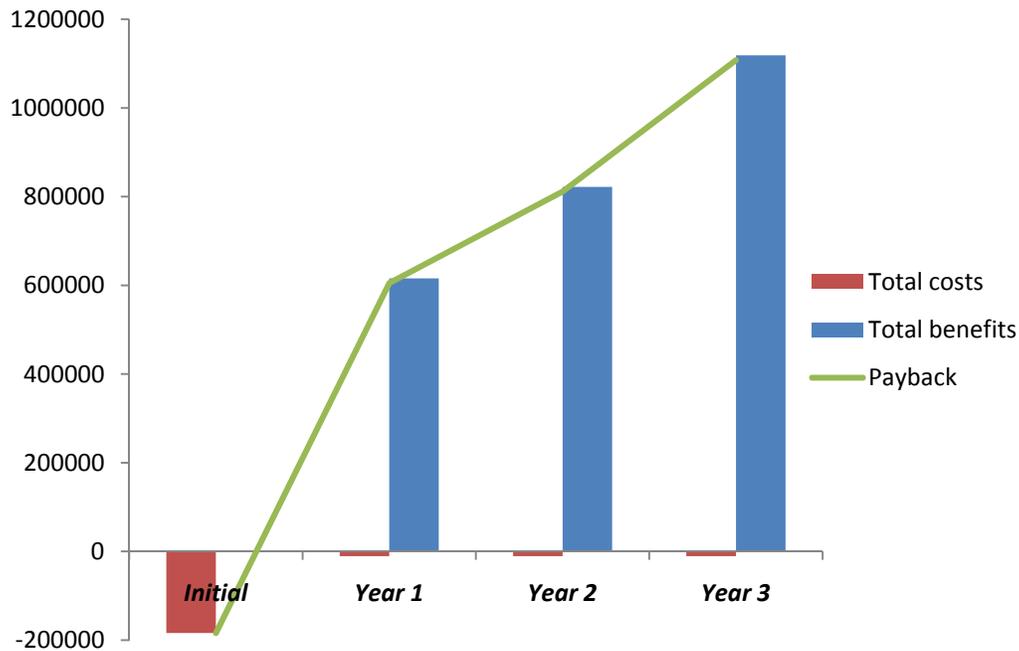
Table 1 illustrates the risk-adjusted financial results that were achieved by the composite organization. The risk-adjusted values take into account any potential uncertainty or variance that exists in estimating the costs and benefits,

which produces more conservative estimates. The following factors may affect the financial results that an organization may experience:

- Using third-party professional services specializing in virtualization let organizations mitigate any perceived risk when virtualizing their mission-critical or business-critical applications.
- Using VMware to virtualize Oracle databases allowed organizations to standardize on more affordable servers. This enabled the organizations interviewed to reduce the ongoing maintenance cost of their hardware.
- Reduction of planned and unplanned downtime allowed IT to perform a majority of system upgrades and maintenance tasks with little or no interruption to the end users.

Figure 1

Composite Organization Three-Year Risk-Adjusted Analysis



Source: Forrester Research, Inc.

Disclosures

The reader should be aware of the following:

- The study is commissioned by VMware and delivered by the Forrester Consulting group.
- Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in VMware vSphere for mission- or business-critical Oracle database deployments.

- VMware 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.
- The customers interviewed for this study were provided by VMware.
- All numbers have been rounded throughout the study.

TEI Framework And Methodology

Introduction

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering deployment of Oracle databases on VMware vSphere. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

Approach And Methodology

Forrester took a multistep approach to evaluate the impact that VMware vSphere can have on an organization (see Figure 2). Specifically, we:

- Interviewed VMware marketing, sales, consulting personnel, and Forrester analysts to gather data relative to vSphere and the marketplace for vSphere.
- Interviewed four organizations currently using VMware vSphere to obtain data with respect to costs, benefits, and risks.
- Designed a composite organization based on characteristics of the interviewed organizations (see Appendix A).
- Constructed a financial model representative of the interviews using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews as applied to the composite organization.

Figure 2

TEI Approach



Source: Forrester Research, Inc.

Forrester employed four fundamental elements of TEI in modeling VMware vSphere’s service:

1. Costs.

2. Benefits to the entire organization.
3. Flexibility.
4. Risk.

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

Analysis

Interview Highlights

A total of four customers were interviewed for this study, including:

1. An educational institution with more than 100,000 students, faculty, and administrative employees and 200 research centers and institutions. The organization said it has virtualized more than 98% of its x86 server environment and more than 90% of its mission-critical Oracle databases using VMware.
2. A Fortune 500 manufacturing firm with global reach. The organization supports more than 8,000 end users and manages two data centers. It said about 99% of its x86 environment and 100% of its mission-critical Oracle databases are virtualized with VMware.
3. A large medical and scientific testing facility with 28,000 employees serving 220,000 clients, including physicians' offices, hospitals, managed care organizations, and biotechnology and pharmaceutical companies.
4. A large non-US educational institution that has 54,000 students.

The interviews uncovered the following relevant points:

- Most customers interviewed stated that they virtualized their Oracle databases to reduce hardware failure.
- Customers only virtualized their Oracle databases after gaining significant experience with and achieving benefits from the virtualization of other applications on VMware vSphere — primarily back-office applications. For our interviewees, their Oracle databases qualified as mission-critical or business-critical applications. Customers interviewed said that when they virtualized their Oracle databases on vSphere, their deployments were supported by Oracle and experienced no support-related issues. According to one of the four interviewed organizations, in order for the customer to continue receiving support from Oracle, they were required to produce the issue in a physical environment to ensure it is not an issue related to virtualization. The organization was able to verify that its issues were unrelated to virtualization, and therefore they received the Oracle support that they needed.
- After virtualizing Oracle databases, the customers said their *existing* Oracle databases did not see any reduction in software maintenance costs. This applied to both customers who had enterprise license agreements with

Oracle and those who paid on a per-license basis through Oracle's CPU-based licensing model. However, customers who paid based on CPU-based licensing mentioned that if they implemented a new Oracle database directly in a virtualized environment, they could reduce the total number of licenses (and their related maintenance costs) needed to support the new deployment by 50%.

- A director of IT at one of the interviewed companies said his organization has started virtualizing the mission-critical Oracle databases on VMware vSphere a few years ago. While they have increased the total number of mission-critical Oracle databases, by virtualizing hardware, they have seen reduction in the time DBAs spend on support by 50%. Hardware failure had a great impact on how they spent their time. Other benefits included freeing up DBAs to work on higher value-add activities, faster time-to-market with new services and features, and improving end user productivity through less frequent planned and unplanned downtime.
- As the customers interviewed had already virtualized their back-office applications, they already had the experience and skills necessary to deploy, manage, and exploit the solution in-house. However, due to the perceived complexity and risk associated with virtualizing mission- and business-critical Oracle databases, they were now virtualizing; three out of four brought in a professional services team to provide proof of concept support, create a transition framework, and apply best practices to this transition. These third parties also helped create a knowledge-sharing venue for IT and facilitate meetings with business users to ensure no ambiguity regarding the performance and rollout expectations of virtualizing their Oracle databases.
- All customers said they realized power and cooling and data center space cost savings.
- Customers interviewed said they achieved virtualization ratios of 7 to 1 to 15 to 1 virtual machines per physical host with their Oracle databases.

Composite Organization

Based on the interviews with the four customers provided by VMware, Forrester constructed a composite company then applied the Forrester TEI framework and an associated ROI analysis to the composite that illustrates the financial impacts of this change. The composite organization synthesized represents an organization that virtualized 55 physical servers running Oracle databases. The organization used a 10 to 1 consolidation ratio, placing 10 virtual machines on each server. These servers are configured with two physical processors thus requiring two VMware vSphere 5 licenses.² We assume that the composite organization was able to eliminate 49 servers. Prior to virtualization, the organization had 55 physical servers; after virtualization, the organization reduced its number of physical servers to six. The 49 servers eliminated include six AIX servers and 43 x86 servers.

Framework Assumptions

Table 2 provides the model assumptions that Forrester used in this analysis.

Table 2
Model Assumptions

Ref.	Metric	Calculation	Value
A1	Hours per week		40
A2	Weeks per year		52
A3	Hours per year (M-F, 9-5)	(A1*A2)	2,080
A4	Average fully loaded annual salary of an end user ³		\$100,000
A5	Hourly	(A4/A3)	\$48

Source: Forrester Research, Inc.

The discount rate used in the present value (PV) and NPV calculations is 10%, and the time horizon used for the financial modeling was three years. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with their company's finance department to determine the most appropriate discount rate to use within their own organizations.

Costs

This section describes and lists the costs related to planning, testing, and implementing VMware vSphere in support of Oracle databases for the composite organization over a three-year period. Cost assumptions are based on aggregated findings from the customers interviewed for this TEI study. All costs are based on list prices and do not include any negotiated discounts. The following cost model can serve as a framework for other organizations.

VMware Software License And Support Fees

This category represents 30% of the overall investment and includes the license and maintenance cost of using VMware vSphere 5. Based on the interviews with customers, we are estimating that the composite organization has 55 Oracle databases. Customers interviewed had consolidation ratios of 7 to 15 databases. To remain conservative, we are assuming a consolidation ratio of 5 to 1 meaning five databases per CPU. Assuming a dual-processor system with multiple cores per proc, a customer would put 10 databases on one system. To remain conservative, we are assuming a 10 to 1 ratio of VMs per server and assume a dual-processor server.⁴ Therefore, if the composite organization has 55 databases, that means the organization will need 5.5 rounded off to six servers. For six servers with dual processors, the organization would be required to purchase 12 vSphere licenses. For the purposes of this calculation, we are assuming that the composite organization purchases vSphere 5 Enterprise Plus, which the highest available edition of vSphere is providing 96 GB of vRAM entitlement per license. Table 3 illustrates the calculation.

Table 3

VMware vSphere License And Support Fees

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
B1	Number of VMware vSphere licenses		12			
B2	License fees Enterprise Plus edition (per CPU)		\$3,495			
B3	Annual Enterprise Plus production support		\$0	\$874	\$874	\$874
Bt	Software license and support fees	$B1*(B2+B3)$	\$41,940	\$10,488	\$10,488	\$10,488

Source: Forrester Research, Inc.

Planning, Testing, And Implementation Costs

The implementation cost includes the internal resources required to plan, test, and deploy the solution. This category represents 36% of the overall investment. The roles involved in this phase include a system architect, a VMware engineer, and a database administrator. With an average fully loaded hourly rate of \$70 per hour,⁵ we estimated these individuals contributed 320 hours each to this phase. Our interviewed customers said they had spent, on average, several weeks on planning and testing prior to deployment to ensure the business owners and IT were in full agreement, and mission-critical or business-critical applications would not experience any unplanned downtime. This preparation resulted in successful implementations for the customers interviewed; they met their service-level agreement requirements and provided better availability to their internal and external customers. Table 4 provides the calculations for this section.

Table 4

Planning, Testing, And Implementation Costs

Ref.	Metric	Calculation	Initial
C1	Number of people		3
C2	Average fully loaded hourly rate		\$70
C3	Number of hours allocated to virtualization initiative		320
Ct	Planning, testing, and implementation costs	$C1*C2*C3$	\$67,200

Source: Forrester Research, Inc.

Professional Services Fees

This section describes the third-party resources associated with the physical to virtual migration of Oracle databases. The prior section was primarily focusing on the internal resources. The organizations interviewed for this study virtualized more than 90% of their mission-critical Oracle databases. Initially, they had virtualized their back-office

applications on VMware vSphere and felt confident to tackle their mission- or business-critical applications using vSphere. For this study, we are primarily focusing on virtualization of Oracle databases. Our interviewees agreed that unlike back-office applications, the Oracle databases had deep roots in the organizations. They consisted of a series of mission- or business-critical applications that were often tied into a series of SLAs. To ensure business units are on agreement, the organizations decided to proceed with a series of proof of concepts engagement to facilitate the transition. Every customer interviewed mentioned that the IT team began by prioritizing simple to complex databases. The least complex applications were migrated first. Then the team began tackling larger and more complex databases. This activity typically took a couple of years, and the organizations found that it would be helpful to hire third-party professional services to facilitate proof of concepts and create frameworks for migration. As a part of this exercise, the consultants made a presentation to business groups who were concerned with the perceived risks associated with virtualization of Oracle databases. Organizations that have in-house expertise to virtualize may not need to hire a third-party professional services firm. The three of the four customers interviewed hired third-party professional services.

To model the investment for this study, we are assuming that the composite organization virtualized 55 Oracle databases during the investment's initial period or Year 0. Based on the interviews with customers that used third-party professional services, we estimate that the organization employed a third-party firm for a total of 320 man-hours.⁶ With an average hourly rate of \$200, we estimate a total cost of \$64,000. Table 5 represents the calculation; this category is 34% of the overall costs.

Table 5
Third-Party Professional Services Fees

Ref.	Metric	Calculation	Initial
D1	Number of man-hours		320
D2	Average hourly rate per consultant		\$200
Dt	Third-party professional services fees	$D1 * D2$	\$64,000

Source: Forrester Research, Inc.

Total Costs

Table 6 summarizes costs associated with implementation of VMware vSphere. Figure 3 illustrates the breakdown of costs.

Table 6

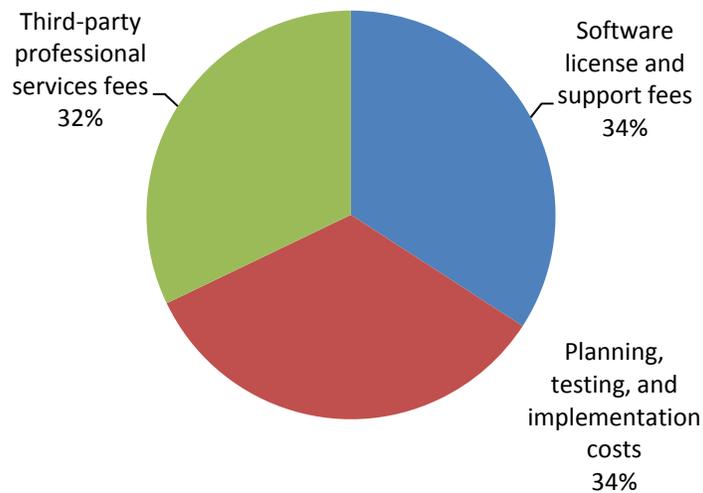
Total Costs — Non-Risk-Adjusted

Costs	Initial	Year 1	Year 2	Year 3	Total	PV
Software license and support fees	(\$41,940)	(\$10,488)	(\$10,488)	(\$10,488)	(\$73,404)	(\$68,022)
Planning, testing, and implementation costs	(\$67,200)				(\$67,200)	(\$67,200)
Third-party professional services fees	(\$64,000)				(\$64,000)	(\$64,000)
Total cost	(\$173,140)	(\$10,488)	(\$10,488)	(\$10,488)	(\$204,604)	(\$199,222)

Source: Forrester Research, Inc.

Figure 3

Total Costs Breakdown — Non-Risk-Adjusted



Source: Forrester Research, Inc.

Benefits

The benefits that we had sufficient data to quantify financially are capital savings, operational reductions, and productivity gains. There are seven quantifiable benefits that represented a three-year risk-adjusted PV of \$2,027,681. These benefits include power and cooling savings, data center space cost savings, hardware and software savings, hardware support savings, reduction in ongoing administrative cost, reduced downtime for end users, and disaster recovery cost avoidance.

The benefits that are financially quantifiable but for which we were unable to obtain sufficient data to include in this study are the following:

- The improvement in time-to-market of applications that IT delivers to the business units, which makes end users efficient or speeds the creation of products or services that improves the bottom line.
- The reduction in number of Oracle licenses when an organization creates a new database directly in the virtualized environment.⁷

The savings in this study primarily represent the customers that virtualized their existing databases from physical to virtual VMware environments.

Hardware Maintenance Cost Savings

Another benefit described by our interviewees is the reduction from hardware maintenance costs which represents 28% of the overall savings. As our interviewees were able to reduce the number of servers, the Oracle databases were running on the most expensive equipment that required a significant annual maintenance cost. With the release of vSphere and the improvement in x86, the organization we interviewed saw a 10 to 1 savings on their hardware investment. They could easily replace a specialized server that would cost \$400,000 with a standard server. These organizations paid, on average, 10% hardware maintenance fees annually.

We assume that the composite organization was able to reduce six large servers with an average maintenance cost of \$40,000 and 43 standard servers with an average maintenance cost of \$800. To remain conservative and account for implementation, based on our interviews, we estimate that the composite organization captures 75% of the benefits in Year 1, 100% in Year 2, and 100% in Year 3. Table 7 presents the calculation.

Table 7

Hardware Maintenance Cost Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
E1	Number of physical boxes (AIX)		6		
E2	Average cost per equipment		\$400,000		
E3	Number of physical boxes		43		
E4	Average cost of server		\$8,000		
E5	Average annual hardware maintenance		10%		
E6	Percent of benefit capture		75%	100%	100%
Et	Hardware maintenance cost savings	$([E1*E2]+[E3*E4])*E5*E6$	\$205,800	\$274,400	\$274,400

Source: Forrester Research, Inc.

Power And Cooling Cost Savings

This section represents 23% of the overall benefit for the composite organization. Power and cooling costs is an ongoing issue for data centers. As organizations grow their computing power, the facility management and planning continues to be a challenge for IT executives and facility managers. Organizations interviewed for this report cited virtualization as one of the primary reasons to seek out ways to reduce continuously rising power and cooling costs. Customers mentioned that with the electricity cost rising, they needed to find a way to project electricity cost and better manage operating expenses. To grow their computing power, they had to find a solution that enabled them to reduce overall power and cooling costs to accommodate the growth with a capped power capacity. We estimate that the composite company reduced server count from 55 physical servers to six that led to a saving of \$601,987 over three years. Table 8 presents this calculation.

Table 8

Power And Cooling Cost Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
F1	Number of hours of operation	52*7*24	8,736		
F2	Number of physical servers before virtualization		55		
F3	Number of servers after virtualization	Dual core x86 system	6		
F4	The difference in average operating power per KW per server for virtualized versus physical		10%		
F5	Increased in operating power for cooling		35%		
F6	Cumulative annual increase in electricity costs		0%	4%	8%
F7	Electricity cost (KW hours)		\$0.20		
F8	Percent of benefit captured		75%	100%	100%
Ft	Power and cooling cost savings	$[(F1*(F2-F3)*(1+F4)*(1+F6)*F7)+[F1*(F2-F3)*(1+F5)*(1+F6)*F7]]*F8$	\$157,314	\$218,141	\$226,531

Source: Forrester Research, Inc.

Reduction In Ongoing Administrative Costs

This category represents the reduction in time and effort when managing Oracle databases. This savings contributes 21% of the overall benefits for the composite organization. As a result, customers migrating to VMware said that they were able to reduce IT administrative costs by 50% using Linux or Windows environment.

We assume that the composite organization had four database administrators. With an average fully loaded salary of \$100,000, based on the interviews completed, we estimate that the DBAs reduced their management effort with the virtualized databases. To remain conservative and account for the time-to-deployment, we estimate that the composite organization realizes 75% of this benefit in Year 1, 100% in Year 2, and 100% in Year 3. Table 9 presents the calculation.

Table 9

Reduction In Ongoing Administrative Costs

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
G1	Number of IT database administrators		4		
G2	Average annual fully loaded salary		\$100,000		
G3	Percent effort saved		50%		
G4	Percent of benefit captured		75%	100%	100%
Gt	Reduction in ongoing administrative cost	$G1 * G2 * G3 * G4$	\$150,000	\$200,000	\$200,000

Source: Forrester Research, Inc.

Reduced Downtime For End Users

This category represents 12% of the total benefits gained and is composed of the productivity gain for end users when IT can reduce the number of planned and unplanned downtime by virtualizing mission-critical Oracle databases on VMware vSphere. We estimate that 1,000 employees were affected by a series of planned and unplanned downtime resulting from hardware failure in the prior deployment. Based on the interviews, we assume that users experienced 5 hours of total downtime annually. The percent of time recovered and translated to productive time is about 50%. To remain conservative, we estimate that the composite organization realizes 75% of these benefits in Year 1, 100% in Year 2, and 100% in Year 3. Table 10 illustrates the calculation. Readers should note that the interviewees have estimated and tracked end user productivity and associated this benefit with the reduction of hardware failure and downtime prior to virtualization. This is not related to any downtime associated with disaster recovery. A separate benefit will address the gains associated with disaster recovery.

Table 10

Reduced Downtime For End Users

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
H1	Number of end users		1,000		
H2	Average fully loaded hourly rate		\$48		
H3	Annual number of hours (saved)		5		
H4	Percent time translated to productivity		50%		
H5	Percent benefit captured		75%	100%	100%
Ht	Reduced downtime for end users	$H1*H2*H3*H4*H5$	\$90,000	\$120,000	\$120,000

Source: Forrester Research, Inc.

Hardware Refresh Cost Savings

This category represents 10% of the total benefits. Organizations that virtualized their Oracle databases eliminated the costs necessary to upgrade and refresh their existing hardware.

The interviewed organizations estimated that they were expecting to refresh as much as 75% of the hardware that hosted Oracle databases within three years. For the composite organization, 49 servers (F2-F3) were needed after virtualization. To remain conservative, we assume that the organization realized 75% of the benefits associated with the refresh cost avoidance during the third year of cash flow analysis. The calculation for this one-time savings is illustrated in Table 11.

Table 11

Hardware Refresh Cost Avoidance

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
I1	Number of servers		49		
I2	Average cost per server		\$8,000		
I3	Percent captured		0%	0%	75%
It	Hardware refresh cost avoidance	$I1*I2*I3$	\$0	\$0	\$294,000

Source: Forrester Research, Inc.

Disaster Recovery Cost Avoidance

This section represents 5% of the overall benefits. Our interviews revealed that customers were able to protect their system against incidents that could have led to losses if they didn't have the agility that they realized through virtualization using VMware. Most customers interviewed were not closely track associated benefit. One of the four customers interviewed was able to articulate its related downtime when it effected few satellite operations.

To estimate this category, based on the interviews with customers using VMware vSphere, we have created the following framework for the composite organization. We assume that the organization handles 5,000 transactions daily. At a cost of \$50 per transaction,⁸ if the system experienced a hardware failure, the organization would have lost 5,000 transactions*4 days*\$50 per transaction. We estimate that the probability of loss is 5%. To remain conservative, we assume 50% of the benefits are captured in Year 1, 100% in Year 2, and 100% in Year 3. Table 12 presents this calculation. We urge readers to estimate disaster recovery for their environment.

Table 12

Disaster Recovery Cost Avoidance

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
J1	Number of daily transactions		5,000		
J2	Average cost per transaction		\$50		
J3	Number of days the system was impacted		4		
J4	Probability of exposure		5%		
J5	Percent benefit captured		50%	100%	100%
Jt	Disaster recovery cost avoidance	$J1*J2*J3*J4*J5$	\$25,000	\$50,000	\$50,000

Source: Forrester Research, Inc.

Data Center Space Cost Savings

This benefit represents 1% of the overall benefits. Our interviewees reduced the number of physical hardware by virtualizing, creating space in the data center for new initiatives, and thus avoiding real estate and management cost associated with data center expansion or the acquisition of colocation space. Here, we are only measuring the real estate cost savings. Table 13 presents the calculation.

Table 13

Data Center Space Cost Savings

Ref.	Metric	Calculation	Initial
K1	Reduction in the number of physical servers	F2-F3	49
K2	number of servers per rack		12
K3	Number of racks eliminated	K1/K2	4
K4	Average square footage per rack		4
K5	Average annual cost per square footage		\$1,000
Kt	Data center space cost savings	K3*K4*K5	\$16,000

Source: Forrester Research, Inc.

Time-To-Market Benefits

Another benefit that we identified but our customers did not have sufficient data to quantify was the improvement in time-to-market associated with products and services that IT creates for business end users. Forrester has a framework for organizations to measure the impact of this value, presented in Table 14.

Table 14

Time-To-Market Benefits

Ref.	Metric	Calculation
L1	Number of applications deployed	
L2	Average cost per application deployment	
L3	Average time-to-deploy (months) — pre-VMware	
L4	Estimated improvement in time-to-deploy (months) — post-VMware	
L5	Average application ROI — three-year	
L6	Cost of capital	
Lt	Reduced application deployment time	$\frac{((L1*L2)*(1+L5))/(3*12-L3)}{(L4*L5)*L6/12}$

Source: Forrester Research, Inc.

Reduction In Oracle License Costs

This is one of the two quantifiable benefits that we identified as quantifiable, but we were unable to gather enough information because our interviewees has not implemented any new databases since migrating from physical to virtual. Customers, who purchased Oracle licenses on per CPU basis, explained that if they implemented a new database immediately in the virtual environment, they could save as much as 50% on their total license purchase.

Total Benefits

Table 15 summarizes the total quantified benefits of using VMware vSphere to virtualize Oracle databases.

Table 15

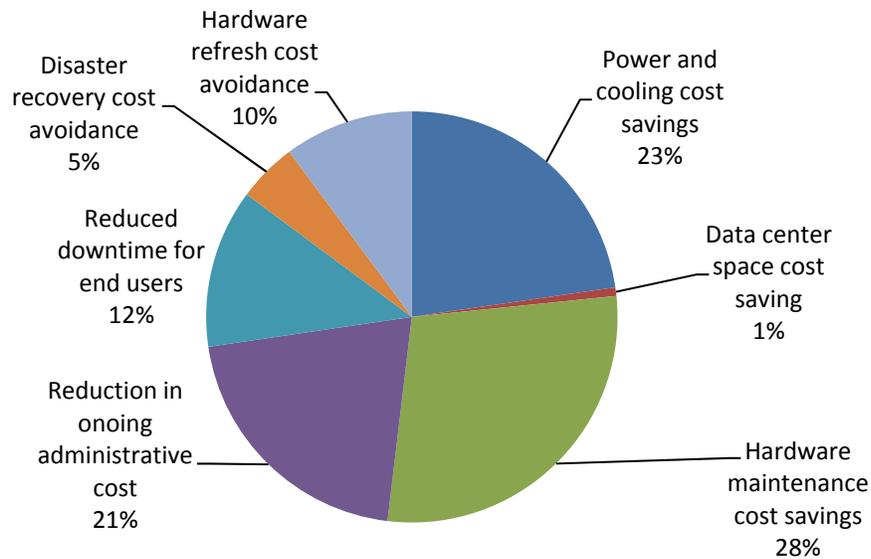
Total Benefits — Non-Risk-Adjusted

Benefits	Year 1	Year 2	Year 3	Total	PV
Hardware maintenance cost savings	\$205,800	\$274,400	\$274,400	\$754,600	\$620,029
Power and cooling cost savings	\$157,314	\$218,141	\$226,531	\$601,987	\$493,491
Reduction in ongoing administrative cost	\$150,000	\$200,000	\$200,000	\$550,000	\$451,916
Reduced downtime for end users	\$90,000	\$120,000	\$120,000	\$330,000	\$271,150
Hardware refresh cost avoidance			\$294,000	\$294,000	\$220,887
Disaster recovery cost avoidance	\$25,000	\$50,000	\$50,000	\$125,000	\$101,615
Data center space cost savings	\$16,000			\$16,000	\$14,545
Total	\$644,114	\$862,541	\$1,164,931	\$2,671,587	\$2,173,633

Source: Forrester Research, Inc.

Figure 4

Total Benefits Breakdown — Non-Risk-Adjusted



Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for some future additional investment. This provides an organization with the “right” or the ability to engage in future initiatives but not the obligation to do so. There are multiple scenarios in which a customer might choose to implement VMware and later realize additional uses and business opportunities. Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix B).

The composite organization can virtualize newly created databases using the existing framework with small incremental costs.

Risk

Forrester defines two types of risk associated with this analysis: implementation risk and impact risk. “Implementation risk” is the risk that a proposed investment in vSphere may deviate from the original or expected requirements, resulting in higher costs than anticipated. “Impact risk” refers to the risk that the business or technology needs of the organization may not be met by the investment in vSphere, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

Quantitatively capturing investment and impact risk by directly adjusting the financial estimates results in more meaningful and accurate estimates and a more accurate projection of the ROI. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates. The risk-adjusted numbers should be taken as “realistic” expectations, as they represent the expected values considering risk.

The following implementation risks that affect costs are identified as part of this analysis:

- **Planning, testing, and implementation.** Our interviewed customers had previous experience with VMware vSphere. That meant that they had the necessary expertise to quickly and easily virtualize Oracle databases on vSphere. If a reader's organization has no or limited prior experience with virtualization, it will most likely result in a longer rollout period and the possible need for some professional services.
- **Third-party professional services.** Customers interviewed used professional services to create a framework for product rollout and ensure business users' need is also considered. Organizations that may seek greater level of support may experience higher cost, as the professional services involvement will not be limited to proof of concept and high-level support.

The following impact risk that affects benefits is identified as part of the analysis:

- **Disaster recovery cost avoidance.** Some of the customers interviewed measured the cost avoidance associated with disaster recovery. Disaster recovery, while it is important, is a secondary tier benefit, and users are often unaware to measure it. The readers should consider their own environment and the probability of risk.

Table 16 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points.

Table 16

Cost And Benefit Risk Adjustments

Costs	Low	Most likely	High	Mean
Software license and support fees	98%	100%	105%	101%
Planning, testing, and implementation costs	100%	100%	125%	108%
Third-party professional services fees	100%	100%	125%	108%
Benefits	Low	Most likely	High	Mean
Power and cooling cost savings	90%	100%	105%	98%
Data center space cost savings	90%	100%	105%	98%
Hardware and software cost savings	80%	100%	103%	94%
Hardware maintenance cost savings	80%	100%	103%	94%
Reduction in ongoing administrative cost	90%	100%	105%	98%
Reduced downtime for end users	80%	100%	103%	94%
Disaster recovery cost avoidance	50%	100%	100%	83%

Source: Forrester Research, Inc.

Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Financial Summary

The financial results calculated in the Costs and Benefits sections can be used to determine the ROI, NPV, and payback period for the organization's investment in vSphere. These are shown in Table 17 below.

Table 17

Cash Flow — Non-Risk-Adjusted

Categories	Initial	Year 1	Year 2	Year 3	Total	PV
Costs	(\$173,140)	(\$10,488)	(\$10,488)	(\$10,488)	(\$204,604)	(\$199,222)
Benefits		\$644,114	\$862,541	\$1,164,931	\$2,671,587	\$2,173,633
Net benefits	(\$173,140)	\$633,626	\$852,053	\$1,154,443	\$2,466,983	\$1,974,411
ROI	991%					
Payback period	3 months					

Source: Forrester Research, Inc.

Table 18 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 16 in the Risk section to the cost and benefits numbers in Tables 6 and 15.

Table 18

Cash Flow — Risk-Adjusted

Categories	Initial	Year 1	Year 2	Year 3	Total	PV
Costs	(\$184,055)	(\$10,593)	(\$10,593)	(\$10,593)	(\$215,834)	(\$210,398)
Benefits		\$615,650	\$822,015	\$1,118,357	\$2,556,021	\$2,079,273
Net benefits	(\$184,055)	\$605,057	\$811,422	\$1,107,764	\$2,340,187	\$1,868,875
ROI	888%					
Payback period	4 months					

Source: Forrester Research, Inc.

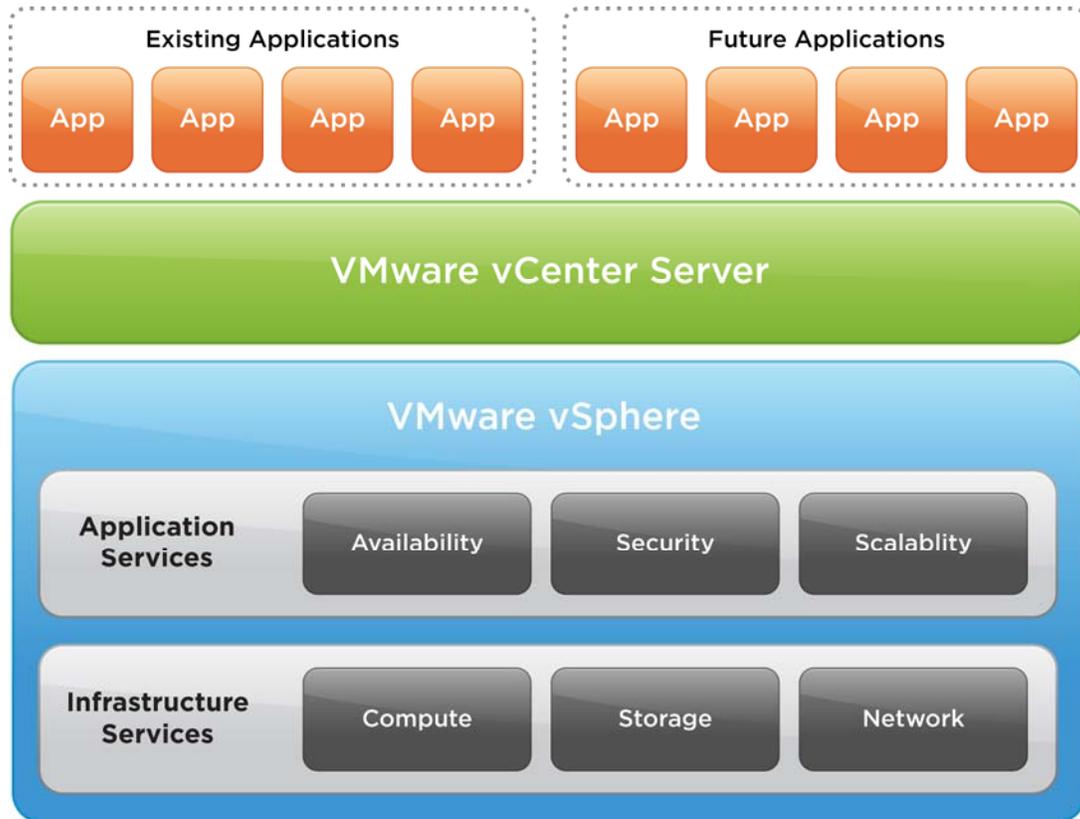
VMware vSphere: Overview

According to VMware, vSphere is a complete virtualization platform, with infrastructure services that transform IT hardware into a high-performance shared computing platform and application services that help IT organizations deliver the highest levels of availability, security, and scalability.

Open Architecture

VMware offers an open, standards-based approach to virtualization that allows customers to leverage existing tools and infrastructure while adopting next-generation applications. vSphere also includes a comprehensive set of APIs for building tools and solutions that enhance and extend storage, networking, security, and management capabilities.

Figure 5
vSphere Architecture



Source: Forrester Research, Inc.

Appendix A: Composite Organization Description

For this TEI study, Forrester has created a composite organization to illustrate the quantifiable costs and benefits of implementing VMware vSphere to virtualize Oracle databases. The composite company is intended to represent an organization that had 55 physical servers that housed its Oracle databases and is based on characteristics of the interviewed customers.⁹ We assume that the composite organization was able to eliminate 49 servers. Prior to virtualization, the organization had 55 physical servers; after virtualization, the organization reduced its number of physical servers to six. The 49 servers eliminated include six AIX servers and 43 x86 servers.

During the discovery phase, the composite organization allocated 320 man-hours of a VMware administrator, a Linux administrator, and a database administrator to planning, testing, and implementation phase.

In purchasing VMware vSphere, the composite company has the following objectives:

- Reduce power, cooling, and data center real estate as the IT footprint is growing.
- Seek better availability of its business-critical applications and disaster recovery.
- Seek rapid provisioning and aiming to reduce its overall management costs.
- Customers seeking stringent SLA ratios and RPOs.
- Reduce total cost of ownership of its new application acquisition.

For the purpose of the analysis, Forrester assumes that more than 90% of its Oracle databases are virtualized. The organization was comfortable and familiar with virtualization, and they have completed the physical to virtual migration of their back-office applications.

Appendix B: Total Economic Impact™ Overview

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies 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.

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 form 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: 1) the likelihood that the cost and benefit estimates will meet the original projections, and 2) 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 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, companies often set a discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their respective 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. 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 Framework Assumptions section) 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 flows in each year.

Table [Example]

Example Table

Ref.	Category	Calculation	Initial cost	Year 1	Year 2	Year 3	Total

Source: Forrester Research, Inc.

Appendix D: Endnotes

¹ Forrester risk-adjusts the summary financial metrics to take into account the potential uncertainty of the cost and benefit estimates. For more information on Risk, please see page 16.

² The pricing and licensing agreement for enterprise-level agreement are outlined in the link below. Readers should contact VMware for most up-to-date pricing information. (<http://www.vmware.com/products/vsphere/pricing.html>)

³ This table illustrates a sample calculation for a non-IT user.

⁴ Readers should note that VMware vSphere 5 licensing is based on the number of physical processor rather than processor cores.

⁵ This is an average hourly rate for three different users (a system architect, a VMware engineer, and a database administrator). According to the interviewed organizations, system architects and VMware engineers typically have higher salaries than database administrators. These organizations estimated the following range of fully loaded salaries: \$185,000 to 160,000 for a system architect; \$150,000 to \$130,000 for a VMware engineer; and \$100,000 for a DBA. We have used these numbers to come up with the average fully loaded hourly rate for this group: $(185,000/2,080 + 150,000/2,080 + 100,000/2,080)$.

⁶ The number of hours associated with the third-party professional services investment was primarily derived from discussion with customers interviewed and their explanation of the statement of work associated with this investment.

The number of 320 man-hours in “Professional Services Fees” category is coincidentally equal to the number of man-hours in the “Planning, Testing, And Implementation Costs” section. Professional services cost is an external cost while planning, testing, and implementation costs is an internal opportunity cost.

⁷ Reduction in Oracle license costs was applicable to customers who are purchasing new Oracle licenses based on CPU pricing. Customers interviewed did not purchase any new licenses, and therefore, Forrester was unable to validate this information with the four customers interviewed. However, during internal stakeholder interviews, Forrester has validated this information with at least one VMware partner.

⁸ The customers interviewed were doing business in different sectors. To measure the impact of virtualization on “Disaster Recovery Cost Avoidance” category, we created a framework and estimated a generic transaction costs to illustrate the framework. Readers are urged to calculate the impact of this benefit for their organization by replacing the transaction costs applicable to their organization.

⁹ The pricing and licensing agreement for enterprise-level agreement is outlined in the link below. Readers should contact VMware for most up-to-date pricing information. (<http://www.vmware.com/products/vsphere/pricing.html>)