

Forrester Consulting

HELPING BUSINESS THRIVE ON TECHNOLOGY CHANGE

Prepared for VMware

February 2008

Total Economic Impact™ Of VMware Virtual Desktop Infrastructure – Financial Services Industry

Project Director: Jonathan Lipsitz

Contributor: Lauren Hughes

FORRESTER®

FORRESTER®

Headquarters

Forrester Research, Inc., 400 Technology Square, Cambridge, MA 02139 USA
Tel: +1 617/613-6000 • Fax: +1 617/613-5000 • www.forrester.com

TABLE OF CONTENTS

Executive Summary	3
Purpose	3
Methodology.....	4
Approach.....	4
Key Findings	4
Disclosures.....	5
VMware Virtual Desktop Infrastructure: Overview	6
Analysis.....	7
Interview Highlights: Financial Services Customer.....	7
TEI Framework	8
Costs	9
Benefits	13
Risk.....	19
Flexibility.....	21
TEI Framework: Summary.....	21
Study Conclusions.....	23
Appendix A: Total Economic Impact Overview	25
Appendix B: Glossary.....	26

© 2008, Forrester Research, Inc. All rights reserved. Forrester, Forrester Wave, RoleView, Technographics, TechRadar, and Total Economic Impact are trademarks of Forrester Research, Inc. All other trademarks are the property of their respective companies. Forrester clients may make one attributed copy or slide of each figure contained herein. Additional reproduction is strictly prohibited. For additional reproduction rights and usage information, go to www.forrester.com. Information is based on best available resources. Opinions reflect judgment at the time and are subject to change.

Executive Summary

In January 2008, VMware commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) that enterprises may realize by deploying VMware Virtual Desktop Infrastructure (VDI). VMware VDI provides companies with the ability to remotely manage and deliver end user desktops from a centralized server environment. This study illustrates the financial impact of moving from a traditional one-PC-per-user model to a centralized, hosted-virtual-desktop delivery model.

In conducting in-depth interviews with an existing VMware VDI financial services customer, Forrester found that the organization achieved significant benefits: some easily measured for this ROI study, and others equally valuable that could not be quantified. Specifically, the benefits fall into the following categories:

- 1) Reduced help desk costs;
- 2) Avoided costs of purchasing new computers for IT labs;
- 3) Reduced outsourcing contract costs by using VMware VDI to move more outsourced activities offshore;
- 4) Reduced cost of local contractors because more work is moved offshore;
- 5) Avoided cost of additional IT hires;
- 6) Office space freed up for other uses;
- 7) Increased user productivity from remote workers;
- 8) Better business continuity and disaster recovery capabilities;
- 9) Necessary data security implemented for enhanced offshore efforts; and
- 10) Better work experience for US IT staff and offshore developers;

To fully understand the potential impact on their organizations, readers should take into consideration all benefits, whether or not they could be quantified for this study

The majority of the benefits this customer realized are from reduced offshore outsourcing costs. This benefit will not apply to many readers' organizations since they will not be implementing VMware VDI for this purpose. However, other benefits will most likely be greater since the company profiled in this study has only just begun to use VMware VDI for US based workers.

This customer was able to provide metrics to quantify components of the first six benefits listed above. For the interviewed customer, Forrester found an anticipated return on investment (ROI) of between 290% and 255% with VMware Virtual Desktop Infrastructure.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of VMware Virtual Desktop Infrastructure on their organizations. Forrester's aim is to clearly

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 VMware VDI.

Methodology

VMware selected Forrester for this project because of its industry expertise in virtualization 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 it 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 TEI in modeling VMware Virtual Desktop Infrastructure:

1. Costs and cost reduction.
2. Benefits to the entire organization.
3. Risk.
4. Flexibility.

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

Approach

Forrester used a four-step approach for this study:

1. Forrester gathered data from existing Forrester research relevant to VMware, VMware VDI, and the virtualization market in general.
2. Forrester interviewed VMware marketing and sales personnel to fully understand the potential (or intended) value proposition of VMware VDI.
3. Forrester conducted a series of in-depth interviews with one organization currently using VMware VDI.
4. Forrester constructed a financial model representative of the interviews. This model can be found in the TEI Framework section below.

Key Findings

Forrester's study yielded the following key findings:

- **ROI.** Based on the interviews with an existing customer, Forrester constructed a TEI framework and the associated ROI analysis illustrating the financial impact areas. As seen in Table 1, the risk-adjusted ROI for this company is 255% with a breakeven point (payback period) of 17 months after deployment.
- **Benefits.** As discussed previously, some of the benefits associated with VMware Virtual Desktop Infrastructure were difficult to quantify for this study. For the purposes of the ROI

analysis, only benefits associated with reduced US-based outsourced resource avoided purchase of new IT lab computers, avoided additional IT hires, and quantified office space savings. Since this customer is using VMware VDI to enable greater offshore development activity, the vast majority of savings are in this area. The risk-adjusted, present value of the benefits for the organization amount to \$11.1 million over a four-year period.

- Costs.** The single largest cost incurred was for servers to host the virtual desktops. The servers this customer deployed exceed the specifications that many other organizations would require. This can result in lower total costs and a faster payback period for a reader's organization. This customer built out their virtual desktop solution prior to the VDI solution being formalized by VMware. However, the license costs described in this study use VMware's current pricing model in order to give the reader information most relevant to any future implementation they may be considering. The risk-adjusted, present value of the costs for the organization amount to \$3.1 million over a four-year period.

Table 1 illustrates the original and risk-adjusted financial results for this customer based on data and characteristics obtained during the 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 estimation, incorporating any potential risk factors that may later affect the original cost and benefit estimates. For a more in-depth explanation of risk and risk adjustments used in this study, please see the Risk section.

Table 1: Company ROI, Original And Risk-Adjusted

Summary financial results	Unadjusted	Risk-adjusted
	(best case)	
ROI — four-year	290%	255%
Payback (months)	15	17
Total four-year costs (PV)	\$3,080,113	\$3,124,263
Total four-year benefits (PV)	\$12,019,227	\$11,092,403
Total four-year net savings (NPV)	\$8,939,113	\$7,968,140
Internal rate of return (IRR)	199%	178%

Source: Forrester Research, Inc.

Disclosures

The reader should be aware of the following:

- The study is commissioned by VMware and delivered by Forrester Consulting.
- 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 customer name for the interviews was provided by VMware.
- 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 VMware Virtual Desktop Infrastructure.
- This study is not meant to be used as a competitive product analysis.

VMware Virtual Desktop Infrastructure: Overview

According to VMware, VMware Virtual Desktop Infrastructure (VDI) is an integrated desktop virtualization solution that delivers enterprise-class control and manageability with a familiar user experience. Built on VMware's virtualization platform, the VMware VDI solution includes VMware Infrastructure 3 software along with VMware Virtual Desktop Manager (VDM), an enterprise-class desktop management server that securely connects users to virtual desktops in the data center and provides an easy to use web-based interface to manage the centralized environment.

VMware VDI allows desktop administrators to:

- **Central administration of desktops from any location:** Manage virtual desktops in a data center to more easily perform upgrades, patches and desktop maintenance.
- **Scalable management:** Store and manage thousands of virtual desktops on hundreds of physical servers from a single management console.
- **Streamlined provisioning:** Deploy new desktops using automatic desktop provisioning.
- **Secure flexible access:** From a wide variety of client devices
- **Desktop isolation:** Give each end user an isolated virtual desktop and help to eliminate the availability and performance problems associated with shared application technologies.

With VMware VDI, end users get a complete, unmodified virtual desktop that behaves just like a normal PC. There is no change to the applications or desktop environment, no application sharing and no retraining required. Based on security policies, administrators can allow users to install applications, customize their desktop environment and use local printers and USB devices. Help Desk technicians can perform tasks in the data center that would normally require an in-person visit.

VMware VDI provides the following additional benefits and protection:

- **Unified management of servers and desktops:** Use a common management interface for administration of desktops and servers throughout the virtual infrastructure.
- **Consolidated backup:** Provide centralized backup for virtual desktops while helping to eliminate backup traffic from the network to improve performance.
- **Automated failover and recovery:** Make it easier to keep desktops running even when server hardware goes down, and recover quickly from natural disasters and unplanned outages.

- **Dynamic load balancing:** Help balance desktop computing resources automatically as user needs and application loads change over time.

Analysis

As stated in the Executive Summary, Forrester took this multistep approach to evaluate the effect that implementing VMware Virtual Desktop Infrastructure can have on an organization:

- Interviews with VMware marketing and sales personnel.
- In-depth interviews with one organization currently using VMware VDI.
- Construction of a financial framework for the implementation of VMware VDI.

Interview Highlights: Financial Services Customer

The customer interviewed for the TEI study was a US-based diversified insurance and financial services company. They have approximately 1,000 US-based IT staff and make significant use of offshore IT development and support. The company has more than 3 million policy holders.

The interviews uncovered the following relevant points:

- The primary reason the customer decided to implement a virtual desktop solution was to enable greater use of offshore outsourcing for IT development and maintenance.
- Prior to implementing VMware VDI, the customer made limited use of offshore IT outsourcing. This was due to customer data security and privacy concerns. Development effort was limited to applications that did not involve customer information.
- After implementing VMware VDI, the customer was able to greatly increase the amount of offshore work because data security concerns were adequately addressed. Offshore workers could not make unauthorized printouts, downloads, or changes to customer information. All sensitive data remains in a secure data center in the customer's US headquarters.
- According to the person who leads the VMware administration team, "We can do more exciting things offshore now." Benefits associated with this included faster time to market with new services and features, lower total cost of delivery, and freeing up US resources to work on higher value-add activities.
- The customer interviewed for this study was using VMware Infrastructure solution prior to implementing a VMware Virtual Desktop Infrastructure solution. This meant that it already had the skills necessary to deploy, manage, and exploit the solution in-house and did not need to use any professional services. The VMware team lead says, "You can't look at VDI as a whole new solution. You can do all the same things as with server virtualization using VMware Infrastructure, it's just with a different operating system."
- The client has benefited from crossover learning and economies of scale between the virtual server and virtual desktop solutions.

- The initial deployment of 60 virtual desktops to offshore workers was such a success that management immediately requested the number be increased to 225, greatly exceeding initial deployment plans.
- In the past two years, they began replacing IT testing labs with virtual desktops. Expanding the solution to include more traditional labs takes “little to no effort.”
- The customer has also recently begun limited use of virtual desktops for US workers so that they can work from home or different office locations. This effort will be expanded in the future.
- End user acceptance of the solution is immediate, since it looks just like its traditional desktop environment.
- The customer’s virtual desktops are on “enterprise-class hardware, so problems can be found and corrected before a catastrophic failure occurs.”

TEI Framework

Introduction

From the information provided in the in-depth interviews, Forrester has constructed a TEI framework for those organizations considering implementation of VMware Virtual Desktop Infrastructure. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Most monetary values shown in this study are rounded to the nearest dollar for presentation simplicity. The actual financial calculations may be based on figures carried to more decimal points than shown here.

Framework Assumptions

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

Table 2: General Assumptions

Ref.	General assumptions	Value
A1	Discount rate	10%
A2	Length of analysis	Four years

Source: Forrester Research, Inc.

Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with finance to determine the most appropriate discount rate to use within their own organizations.

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used within this analysis.

Table 3: Salary Assumptions

Ref.	Metric	Calculation	Value
B1	Fully burdened salary* per IT employee (Year 1)	Increases 3% P.A.	\$91,514
B2	Work days per year		220
B3	Fully burdened* daily cost per IT employee (Year 1)	(B1 / B2)	\$416
B4	Daily cost of a US-located outsourced IT resource		\$600
B5	Daily cost of an overseas-located outsourced IT resource		\$256
B6	Daily cost of an overseas-located outsourced call center resource		\$224

*Includes salary, variable compensation, and all direct benefits (e.g., health insurance)

Source: Forrester Research, Inc.

Many of the cost and benefit calculations are based on the number of virtual desktops deployed and the number of servers needed to host the virtual desktops. Table 4 shows the number of virtual desktops and servers deployed over the life of the study.

Table 4: Server And Desktop Assumptions

Ref.	Metric	Initial	Year 1	Year 2	Year 3	Year 4
C1	Total number of servers	5	20	30	35	38
C2	Total number of offshore virtual desktops	60	350	600	800	1000
C3	Total number of lab servers*	0	0	0	0	2
C4	Total number of lab virtual desktops	0	0	25	50	100

*Virtual desktops for the labs were hosted on the offshore servers in Years 2 and 3.

Source: Forrester Research, Inc.

Costs

This section describes the overall costs to initially implement, further roll out, and maintain the VMware Virtual Desktop Infrastructure solution.

Initial Internal Implementation Costs

The financial services company described in this study built off of its VMware Infrastructure expertise to rollout a VMware Virtual Desktop Infrastructure solution. The time it took them to learn the technology and implement the solution may be less than a reader's organization will experience. This also meant that they did not need to use professional services to assist in the implementation.

Total Economic Impact™ Of VMware Virtual Desktop Infrastructure

The initial implementation to deliver the first 60 virtual desktops had a duration of three months. This effort required the part-time effort of employees from the VMware administration team, IT Security, IT Networking, and business users. The solution was expanded to 225 virtual desktops three months later.

As discussed above, various individuals worked on the implementation during the “initial” period prior to the first deployment. This totaled 90 days of effort. The average fully burdened salary for an IT employee in the initial period of the study was \$416 per day. The resulting implementation labor cost in the initial period is equal to 90 days x \$416 per day, or \$37,438.

Table 5: Initial Internal Implementation Costs, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1
D1	Days of effort		90	65
D2	Daily fully loaded cost	= B3	\$416	416
Dt	Initial internal implementation costs	D1 * D2	\$37,438	\$27,038

Source: Forrester Research, Inc.

Software Licenses And Maintenance

The software licenses depicted in this study reflect what a new customer implementing VMware VDI could expect to pay. This may not be the same that this customer paid since it implemented a virtual desktop solution before the offering was formalized.

This software pricing model is based on the maximum number of concurrent users. To simplify the model, an assumption was made that all virtual desktops are being used concurrently. \$150 is the current list price per concurrent user before any volume discounts. This customer would most likely receive some volume discount, but this is not included in the study. Maintenance and support (VMware calls this Service And Support – SnS) is a required part of a VMware VDI contract and begins at 21% of list price. The 17% maintenance cost used in this model reflects a three year licensing agreement.

Table 6: Software Licenses And Maintenance, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4
E1	List price per maximum concurrent user		\$150	\$150	\$150	\$150	\$150
E2	Increased number of maximum concurrent user licenses	(C2 + C4) – sum [previous years]	60	290	275	225	250
E3	Total license fees	E1 * E2	\$9,000	\$43,500	\$41,250	\$33,750	\$37,500
E4	Maintenance percentage			17%	17%	17%	17%
E5	Annual maintenance and support	E1 * sum E2 [through current year] * E4		\$8,925	\$15,938	\$21,675	\$28,050
Et	Software licenses and maintenance	E3 + E5	\$9,000	\$52,425	\$57,188	\$55,425	\$65,550

Source: Forrester Research, Inc.

Hardware Costs

VMware Virtual Desktop Infrastructure requires servers to host the virtual desktops. This customer's policy is to buy the fastest processors available from their system integrator. Each server is a quad-core HP ProLiant 580 with 64 gigabytes of memory. The cost of a comparable server has decreased during the course of the study. Servers were purchased with a four-year extended warranty which is included in the server costs.

The server specifications and costs described in this study exceed what most readers' organizations would require for a successful VMware VDI implementation. When applying this financial model to their own organization, a reader should consider the cost of hardware they are likely to deploy. In most cases, this should decrease the payback period and increase the ROI.

There are also storage costs associated with hosting the desktop and all files on that desktop. At the beginning of the study, the customer was adding 300 – 400 GB of SAN storage for each additional server. By the end of the study, they were able to add 800 GB – 1 terabyte for the same cost. This customer currently uses a Hitachi Data System NSC 55 platform. Initially, they used an HDS 9585. They upgraded after discovering that a "mid-range frame, for anything above a medium-size implementation, can't keep up with the demand."

No hardware costs for the thin clients/terminals on which offshore end users work were included in this study. Computers would be needed for all offshore workers regardless of VMware VDI being implemented and would be included in the outsourcing contract. Therefore, there is no incremental cost incurred.

The cost of a thin client computer is less than a full PC so there would be a corresponding benefit that has not been calculated for this study. There is also a power and cooling benefit associated with operating thin client computers, as opposed to full PCs, which would apply if implementing thin clients. When a reader is calculating the total financial impact of VMware VDI on their organization,

Total Economic Impact™ Of VMware Virtual Desktop Infrastructure

they should take into consideration the cost to replace/add computers and these associated benefits.

Table 7: Hardware Costs, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4
F1	Number of servers added	$C1+C3[\text{current year} - \text{previous}]$	5	15	10	5	5
F2	Cost per server		\$45,000	\$45,000	\$40,000	\$35,000	\$35,000
F3	Added SAN storage per server		\$28,000	\$28,000	\$28,000	\$28,000	\$28,000
Ft	Hardware costs	$(F1 * F2) + F3$	\$365,000	\$1,095,000	\$680,000	\$315,000	\$315,000

Source: Forrester Research, Inc.

Ongoing Implementation And Support

The support staff is comprised of three individuals who jointly manage both the VMware Virtual Infrastructure solution of 40 host servers and the VMware Virtual Desktop Infrastructure solution of 40 host servers. They are responsible for maintaining and further rolling out these solutions. Since they do not track exactly how much time is spent working on each solution separately, an assumption was made that their effort is split 50/50 between the two solutions. No additional full time IT support staff was added when VMware VDI was deployed. Other ongoing support costs, such as server hosting and maintenance, are included in the hardware costs above.

Table 8: Ongoing Implementation And Support, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4
G1	Number of Full Time Equivalent (FTE) employees			1.5	1.5	1.5	1.5
G2	Annual fully burdened cost	= B1		\$91,514	\$94,260	\$97,087	\$100,000
Gt	Ongoing implementation and support	$G1 * G2$		\$137,271	\$141,389	\$145,631	\$150,000

Source: Forrester Research, Inc.

Total Costs

Table 9 summarizes this customer's costs associated with its implementation and ongoing operation of Virtual Desktop Infrastructure.

Table 9: Total Costs Of VMware VDI, Non-Risk-Adjusted

Ref.	Costs	Initial	Year 1	Year 2	Year 3	Year 4	Total	Present value
Dt	Initial internal implementation costs	\$37,438	\$27,038				\$64,476	\$62,018
Et	Software licenses and maintenance	\$9,000	\$52,425	\$57,188	\$55,425	\$65,550	\$239,588	\$190,335
Ft	Hardware costs	\$365,000	\$1,095,000	\$680,000	\$315,000	\$315,000	\$2,770,000	\$2,374,251
Gt	Ongoing implementation and support		\$137,271	\$141,389	\$145,631	\$150,000	\$574,292	\$453,510
	Total	\$411,438	\$1,311,735	\$878,577	\$516,056	\$530,550	\$3,648,355	\$3,080,113

Source: Forrester Research, Inc.

Benefits

Not all the benefits that this financial services customer realized are easily quantified in this ROI analysis. Therefore, the first half of this section details the benefit calculations that go into the ROI analysis, and the second half describes qualitative benefits that are not included in the ROI analysis. The qualitative benefits are potentially as valuable as the quantitative ones and should be taken into consideration when analyzing the total return on investment offered by VMware VDI.

Outsourcing Savings

As discussed earlier, the primary reason the customer implemented VMware VDI was to establish the necessary data/endpoint security to fully take advantage of offshore development and support opportunities. If the customer was not able to use as many offshore outsourced resources, more of them would need to temporarily come to the US to work on projects as part of the overall outsourcing contract. It is considerably more expensive to have these resources in the US, which would increase the cost of the outsourcing contract. Currently, of the 800 outsourced IT resources that work on the customer's systems, approximately 150 are on a US-based rotation at any given time. By using VMware VDI to enforce proper data security, the customer can have more work completed overseas and keep this number from becoming larger. This customer estimated that 40% more outsourced workers would have to be on rotation in the US at any given time.

Table 10: Outsourcing Savings, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
H1	Existing US-based outsourced resources		30	100	150	150
H2	Additional resources that would be on US rotation	H1 * 40%	12	40	60	60
H3	Annual savings per position	(B4 - B5) * 220 days	\$75,680	\$75,680	\$75,680	\$75,680
Ht	Outsourcing savings	H2 * H3	\$908,160	\$3,027,200	\$4,540,800	\$4,540,800

Source: Forrester Research, Inc.

Help Desk Savings

This customer operated an IT help desk staffed by internal employees. This call center was moved offshore to reduce the labor costs. The US employees were redeployed to fill other needs in the organization, thereby avoiding the need for additional hires.

Table 11: Help Desk Savings, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
I1	Positions moved offshore				5	5
I2	Annual savings per position	B1 - (B6 * 220 days)			\$47,807	\$50,720
It	Help desk savings	I1 * I2			\$239,037	\$253,600

Source: Forrester Research, Inc.

US Contractor Savings

The customer uses local contractors to supplement its IT staff. Once it could make greater use of services from its offshore partner, the number of US contractors decreased. The savings described here include some specific, documented examples where contractor positions were removed or the resource was freed up and moved to other projects. There are probably additional contractor savings that the interviewees were not aware of.

Table 12: US Contractor Savings, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
J1	US contractor positions moved offshore			5	10	15
J2	Annual savings per position	$(B4 - B5) * 220 \text{ days}$		\$75,680	\$75,680	\$75,680
Jt	US contractor savings	$J1 * J2$		\$378,400	\$756,800	\$1,135,200

Source: Forrester Research, Inc.

Avoided Additional Hires

The customer interviewed for this study has a general policy of using internal resources for long-term, strategic needs and outsourcing other needs. An extension of this policy is that under most circumstances, internal employees are not let go when their role is no longer needed. Instead, they are retrained and redeployed to new areas of greatest need.

By freeing up internal IT resources from more basic activities like reimaging PCs, user support, etc., the customer can avoid hiring additional employees. Because the customer has only really begun to use VMware VDI domestically in IT labs, the savings to date have been very limited. They use virtual desktops in labs for regression testing of in-house applications and for hotfix/service-pack testing in conjunction with vendor applications. As the customer continues to roll out VMware VDI for other uses, additional savings in this area should be expected.

Table 13: Avoided Additional Hires, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
K1	Redeployed IT FTEs				1	1
K2	Annual loaded cost				\$75,728	\$78,000
Kt	Avoided additional hires	$K1 * K2$			\$75,728	\$78,000

Source: Forrester Research, Inc.

Avoided PC Purchases

As discussed above, VMware VDI is only being used domestically in any significant way in the IT testing labs. Therefore, the only avoided computer purchases included in this benefit calculation are for adding PCs in the labs. If this customer further deploys VMware VDI across the organization,

significantly more savings should be expected in this area. This potential future benefit is discussed further in the Flexibility section of this study.

Table 14: Avoided PC Purchases, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
L1	Number of PCs not replaced			25	25	50
L2	Cost per PC			\$1,150	\$1,150	\$1,150
Lt	Avoided PC purchases	$L1 * L2$		\$28,750	\$28,750	\$57,500

Source: Forrester Research, Inc.

Office Space Savings

As discussed above, this customer has been closing their IT labs. This has freed up office space that can be used for other purposes and alleviates the need to rent additional office space.

Table 15: Office Space Savings, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4
M1	Total number of labs closed					2
M2	Square feet per lab					400
M3	Annual cost per square foot					\$30
Mt	Office space savings	$M1 * M2 * M3$				\$24,000

Source: Forrester Research, Inc.

Total Quantified Benefits

Table 16 summarizes the total quantified benefits realized by implementing VDI.

Table 16: Total Quantified Benefits, Non-Risk-Adjusted

Ref.	Benefits	Year 1	Year 2	Year 3	Year 4	Total	Present value
Ht	Outsourcing savings	\$908,160	\$3,027,200	\$4,540,800	\$4,540,800	\$13,016,960	\$9,840,416
It	Help desk savings			\$239,037	\$253,600	\$492,637	\$352,804
Jt	US contractor savings		\$378,400	\$756,800	\$1,135,200	\$2,270,400	\$1,656,679
Kt	Avoided additional IT hires				\$100,000	\$100,000	\$68,301
Lt	Avoided PC purchases		\$28,750	\$28,750	\$57,500	\$115,000	\$84,634
Mt	Office space savings				\$24,000	\$24,000	\$16,392
	Total	\$908,160	\$3,434,350	\$5,565,387	\$6,111,100	\$16,018,997	\$12,019,227

Source: Forrester Research, Inc.

Un-quantified Benefits Realized By Customer

Improved Data/Endpoint Security

As alluded to earlier, proper data and endpoint security was necessary before the customer could begin to outsource activities that involved customer information — its principal rationale for implementing VMware VDI. By using thin clients, workstations, or stripped-down PCs, it was possible to easily lock the computers down to prevent data from leaving on USB memory sticks, CDs, or other portable media. Additionally, all the data resides in data centers in the United States. Storing all data domestically in centralized data centers greatly improves security and can help ensure compliance with data privacy regulations. Enforcement of privacy policies that must be communicated to customers is also much easier, as required under the Gramm-Leach-Bliley Act of 1999.

Quantifying security risks and their associated costs can be very difficult. A company often doesn't know that a breach has taken place, particularly in the case of data leakage. A report often cited to estimate the cost of a security breach is the "CSI/FBI Computer Crime And Security Survey".¹ According to the 2007 survey, the average cost per security breach was \$350,524, up from \$168,000 in 2006. Average losses associated with the theft of confidential information, except from

¹ "2007 CSI/FBI Computer Crime And Security Survey". Robert Richardson, et al. Computer Security Institute, 2007.

mobile devices, were \$5,685,000 per incident. The loss associated with data or network sabotage were \$1,056,000 per incident.

An April 2007 Forrester study, "Calculating The Cost Of A Security Breach," provides metrics to calculate the potential cost of a security breach for any given company.² The study calculates the "cost per record" for three different company profiles:

- Low-profile breach in a non-regulated industry (\$90).
- Low-profile breach in a regulated industry (\$155).
- High-profile breach in a highly regulated industry (\$305).

As a financial services provider in a highly regulated industry, any significant breach is likely to be high-profile. Given the 3 million policy holder records held, at \$305 per record, any security breach would result in a very significant cost to the customer.

Improved Work Experience For US Employees And Overseas Workers

Implementing VMware VDI has improved the work experience for several groups across the customer's organization:

- The US-based IT staff now has more time to focus on strategic issues and activities that are more interesting than solely managing desktop computers. It also has less need to personally provide 24x7 support, since there are resources in Asia who can provide support during the night. As VMware VDI is rolled out to more domestic users, the amount of time freed up for more interesting work will increase, further improving this work experience.
- VMware VDI is beginning to be deployed in the US. The employees using VMware VDI can easily access their desktop and information from home or other company offices. This gives them greater flexibility in terms of where and when they work, and it allows them to travel around without carrying a heavy laptop computer.
- Overseas IT resources also get to work on more varied and interesting projects, since applications that touch customers' data can now be easily accessed without compromising on data security.

Increased User Productivity From Remote Working

As discussed above, US-based workers are beginning to have access to virtual desktops. By having access to their desktops and files remotely, they can be more productive. Employees who do not have laptop computers will be able to work from other company locations they need to visit. It will also make it easier to provision desktop environments on the fly to independent agents and other third parties who can quickly and easily access needed information.

Better Business Continuity And Disaster Recovery Capabilities

A corollary to the increased productivity benefit is better business continuity and disaster recovery capabilities. There are two aspects to this capability.

² "Calculating The Cost Of A Security Breach," Khalid Kark, et al. Forrester Research, April 2007.

- Since employees can access their information from a remote location, it is not necessary to build special disaster recovery locations. Employees will be able to go to any other company location or even work from home if their primary place of work is temporarily unavailable to them.
- Virtual desktops can live on a server in any data center, and that location can easily be changed in times of emergency. If the primary data center goes down, a backup site can seamlessly provide users with access to all of their information.

Risk

Risk is the third component within the TEI model. It is used as a filter to capture the uncertainty surrounding different cost and benefit estimates. If a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed because the risks that threaten the project have been taken into consideration and quantified. The risk-adjusted numbers should be taken as “realistic” expectations, since they represent the expected values considering risk. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates.

Each benefit and cost is assigned either a “low,” “medium,” “high,” or “none” risk rating. The following benefits and costs were rated as either low, medium or high risk:

- **Initial internal implementation costs: high risk.** This customer had previous experience with server virtualization. That meant that it had the necessary expertise to quickly and easily roll out VMware VDI. If a reader’s organization has no prior experience with virtualization, it will most likely result in a longer rollout period and the possible need for some professional services.
- **Ongoing implementation and support: medium risk.** This customer is able to spread its ongoing costs across virtual server and desktop solutions. If a reader’s organization does not also use server virtualization, the Full Time Employee costs allocated to managing VMware Virtual Desktop Infrastructure will most likely be greater than this customer experienced.
- **Outsourcing savings: medium risk.** If a reader’s organization is planning to use desktop virtualization for internal users and not outsourcing, this benefit would not apply. However, the other benefits described in this study would be much greater, offsetting the loss of this benefit. A medium risk was assigned to reflect other organizations that may use this solution for outsourcing, but not at as great a level.
- **Help desk savings: low risk.** A reader’s organization may not be outsourcing a help desk, but the number of calls into a PC support help desk should decrease after implementing VMware VDI. Therefore, the organization can expect help desk savings of some type similar to what this customer experienced.
- **US contractor savings: medium risk.** Not all companies make significant use of contractors. If they do not, it will not be possible to eliminate these positions.

For the purpose of this analysis, Forrester risk-adjusts cost and benefit estimates to better reflect the level of uncertainty that exists for each estimate. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first

Total Economic Impact™ Of VMware Virtual Desktop Infrastructure

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.

For example, the risk associated with initial internal implementation costs is defined as “high.” This risk level was chosen because other companies may spend more time and money on the initial implementation than this customer did. Therefore, a reasonable likelihood exists that a reader’s organization will incur more costs of this nature. The original estimated cost is \$37,438. To calculate the risk-adjusted cost, the “most likely” scenario was set at 100% of cost, the “high” scenario was assigned 150% of cost, and the “low” scenario was assigned 110% of cost. The rounded mean of these three values is 120%. The resulting cost used in the risk-adjusted tables is \$44,925, or 120% of \$37,438.

The following tables show the values used to adjust for uncertainty in cost and benefit estimates. Readers are urged to apply their own risk ranges based upon their own degree of confidence in the cost and benefit estimates.

Table 17: Risk Adjustments To Costs

Ref.	Risk adjustments to costs	Risk scoring	Low	Most likely	High	Risk-adjusted
N1	Initial internal implementation costs	High	110%	100%	150%	120%
N2	Software licenses and maintenance	None	100%	100%	100%	100%
N3	Hardware	None	100%	100%	100%	100%
N4	Ongoing implementation and support	Medium	100%	100%	120%	107%

Source: Forrester Research, Inc.

Table 18: Risk Adjustments To Benefits

Ref.	Risk adjustments to benefits	Risk scoring	Low	Most likely	High	Risk-adjusted
O1	Outsourcing savings	Medium	75%	100%	100%	92%
O2	Helpdesk savings	Low	90%	100%	105%	98%
O3	US contractor savings	Medium	75%	100%	100%	92%
O4	Avoided additional IT hires	None	100%	100%	100%	100%
O5	Avoided PC purchases	None	100%	100%	100%	100%
O6	Office space savings	None	100%	100%	100%	100%

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be converted into business benefit for some additional future investment. Flexibility would also be quantified when evaluated as part of a specific project (Please see Appendix A for more detail).

The organization described in this study has several flexibility options that can deliver future benefit. It can expand its outsourcing operation, thereby reducing costs. It also has the option to use VMware VDI for more domestic uses, as it has begun to do. Virtualizing more US employees' desktops can result in greatly reduced PC hardware and IT support costs. However, for this study, these benefits were not quantified as part of the ROI analysis.

TEI Framework: Summary

Considering the financial framework constructed above, the results of the costs, benefits, and risk sections can be used to determine a return on investment, net present value, and payback period. Table 19 and Table 20, below, show the risk-adjusted cost and benefit values, applying the risk-adjustment method indicated in the Risks section and the values from Table 17 and Table 18 to the numbers in Table 9 and Table 16, respectively.

Table 19: Risk-Adjusted Costs

Ref.	Costs	Initial	Year 1	Year 2	Year 3	Year 4	Total	Present value
P1	Initial implementation costs	\$44,925	\$32,446				\$77,371	\$74,421
P2	Software licenses and maintenance	\$9,000	\$52,425	\$57,188	\$55,425	\$65,550	\$239,588	\$190,335
P3	Hardware costs	\$365,000	\$1,095,000	\$680,000	\$315,000	\$315,000	\$2,770,000	\$2,374,251
P4	Ongoing implementation and support		\$146,880	\$151,287	\$155,825	\$160,500	\$614,492	\$485,255
	Total	\$418,925	\$1,326,751	\$888,474	\$526,250	\$541,050	\$3,701,451	\$3,124,263

Source: Forrester Research, Inc.

Table 20: Risk-Adjusted Benefits

Ref.	Benefits	Year 1	Year 2	Year 3	Year 4	Total	Present value
Q1	Outsourcing savings	\$835,507	\$2,785,024	\$4,177,536	\$4,177,536	\$11,975,603	\$9,053,183
Q2	Help desk savings			\$234,256	\$248,528	\$482,784	\$345,748
Q3	US contractor savings		\$348,128	\$696,256	\$1,044,384	\$2,088,768	\$1,524,145
Q4	Avoided additional IT hires				\$100,000	\$100,000	\$68,301
Q5	Avoided PC purchases		\$28,750	\$28,750	\$57,500	\$115,000	\$84,634
Q6	Office space savings				\$24,000	\$24,000	\$16,392
	Total	\$835,507	\$3,161,902	\$5,136,798	\$5,651,948	\$14,786,155	\$11,092,403

Source: Forrester Research, Inc.

The values used throughout the TEI Framework are based on in-depth interviews with one organization. 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 VMware Virtual Desktop Infrastructure.

Study Conclusions

Forrester's in-depth interviews with a financial services company currently using VMware Virtual Desktop Infrastructure yielded several important observations:

- They realized benefits in four general ways:
 - 1) Reduced IT costs – both hardware and support;
 - 2) Reduced outsourcing costs by moving more work offshore;
 - 3) Improved overall data and endpoint security; and
 - 4) Improved working experiences for US and overseas workers.
- It is beginning to use VMware VDI domestically and should begin to realize significantly greater benefits in the areas of reduced PC and IT support costs, as well as other traditional virtualization benefits.
- It views and manages the virtual desktop solution as an extension of its virtual server solution, resulting in greater crossover knowledge and economies of scale between the two solutions.

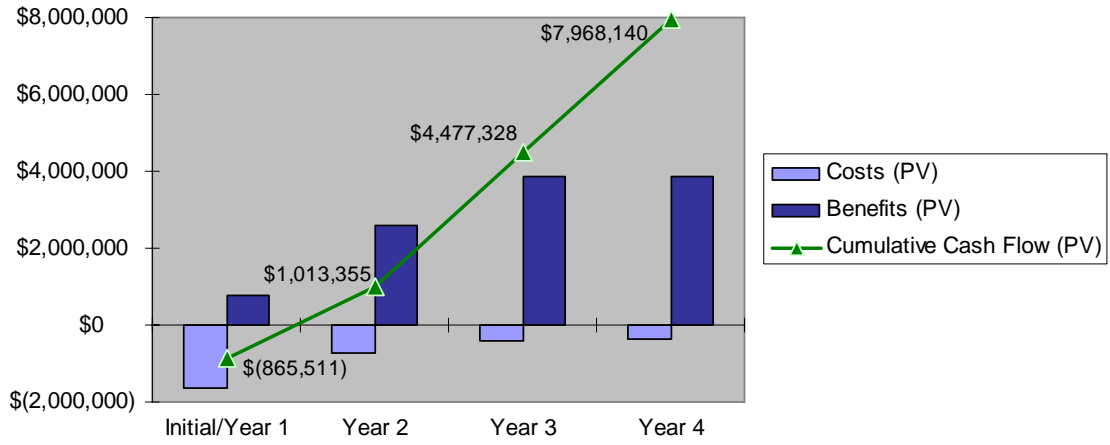
The financial analysis provided in this study illustrates the potential way in which an organization can evaluate the value proposition of the VMware Virtual Desktop Infrastructure solution. Based on information collected in in-depth interviews with one existing financial services customer, Forrester calculated a four-year risk-adjusted ROI of 255% with a payback period of 17 months. All final estimates are risk-adjusted to incorporate potential uncertainty in the calculation of costs and benefits.

Table 21: ROI, Original And Risk-Adjusted

Summary financial results	Unadjusted	Risk-adjusted
	(best case)	
ROI — four-year	290%	255%
Payback (months)	15	17
Total four-year costs (PV)	\$3,080,113	\$3,124,263
Total four-year benefits (PV)	\$12,019,227	\$11,092,403
Total four-year net savings (NPV)	\$8,939,113	\$7,968,140
Internal rate of return (IRR)	199%	178%

Source: Forrester Research, Inc.

Figure 1: Summary Financial Results, Risk-Adjusted



Source: Forrester Research, Inc.

Appendix A: 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. 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 B: 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 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 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 payback period is 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 [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 flows in each year.

Example Table

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

Source: Forrester Research, Inc.