

A Forrester Total Economic Impact™ Study Prepared For Cisco

The Total Economic Impact of Cisco Desktop Virtualization Solutions

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FORRESTER

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Executive Summary

Cisco commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying Cisco Desktop Virtualization Solutions (e.g. [VDI](#)). The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Cisco Desktop Virtualization Solutions on their organizations for virtualizing their traditional physical desktop infrastructures.

A series of in-depth interviews with four existing Cisco Desktop Virtualization Solutions customers, two in financial services, one in education, and one in healthcare, revealed that these organizations reduced their desktop acquisition costs, ongoing IT management and operational costs, and future IT headcount growth costs.

The prior environment for the interviewed organizations consisted primarily of thick client, Windows-based desktops and laptops. Firms invested in Cisco Desktop Virtualization Solutions to deliver hosted desktops and applications for their increasingly distributed workforces at a lower cost than traditional PCs, while also improving collaboration experiences and enabling flexible work styles. The customers interviewed for this study also stated the space savings in the data center reduced the need to either employ a co-op data center expense or migrate to a new space to accommodate the organizations' growing need. These organizations didn't measure the incremental cost, and therefore we didn't quantify it in this study.

Implementing Cisco Desktop Virtualization Solutions Offers Capital and Operational Cost Savings

Our interviews with four existing customers and subsequent financial analysis found that a composite organization based on these companies experienced the risk-adjusted ROI, costs, and benefits shown in Table 1. See Appendix A for a description of the composite organization.

Table 1

Composite Organization Five-Year Risk-Adjusted ROI¹

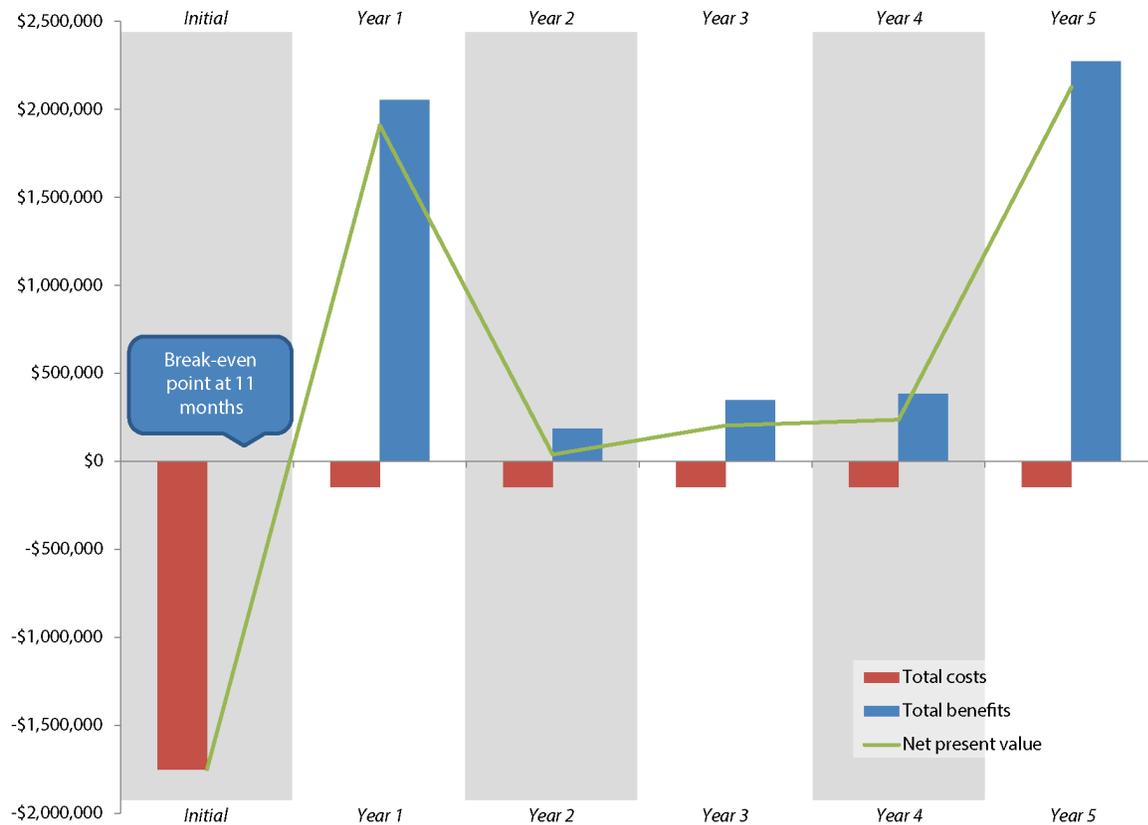
ROI	Payback period	Total benefits (PV)	Total costs (PV)	Net present value
72%	11 months	\$3,954,361	(\$2,299,475)	\$1,654,886

Source: Forrester Research, Inc.

- **Benefits.** The composite organization experienced the following benefits that represent those reported by the interviewed companies:
 - **Endpoint cost savings.** This category represents the reduction in refresh and replacement cost of traditional endpoints with thin or zero clients. This section primarily focuses on hardware cost reduction.
 - **Reduction in future IT growth headcount.** This category represents the reduction in future headcount growth based on the expected increase in demand for service desk staff and data center and workforce computing architects. The organization can reallocate some of its top existing talent to more strategic initiatives and the expansion of key business technology services.
 - **IT staff performance improvement.** This represents the time and effort reduction when automating the infrastructure management in the data center. Organizations are able to maximize their IT resources and eliminate repeatable, mundane tasks.
 - **Server, storage, and network refresh savings.** This category represents the hardware refresh costs that were avoided.
 - **Data center space savings.** This category represents the reduction in data center space after implementing Cisco Unified Computing Systems (UCS).
 - **Power and cooling savings.** This category represents the savings in power and cooling costs between the new UCS environment and the prior traditional server and networking architecture.
 - **Desktop administrator productivity improvements.** This represents an improvement in IT administrator productivity when an organization upgrades or replaces endpoints.
 - **Ongoing desktop management productivity savings.** This category represents ongoing IT management efforts to recover and repair existing endpoints.
- **Costs.** The composite organization experienced the following costs:
 - **Cisco hardware and annual maintenance costs.** This cost represents the total investment in Cisco hardware.
 - **Internal resources allocated to planning, testing, and deployment.** This category represents the IT staff time allocated to planning, testing, and deployment of Cisco Desktop Virtualization Solutions.
 - **Third-party desktop software and storage cost estimates.** This category represents the estimate in third-party desktop virtualization software and storage costs associated with the deployment of Cisco Desktop Virtualization Solutions.
 - **Professional fees.** This cost represents the investment in professional services to assist in planning and implementation.

Figure 1 illustrates the five-year risk-adjusted financial summary for the composite organization. It is important to note that the spikes in benefit for years 1 and 5 are the result of endpoint related cost savings. Based on the interviews with the customers, we estimated a three-year endpoint refresh cycle.

Figure 1
Composite Organization Five-Year Risk-Adjusted Financial Summary



Source: Forrester Research, Inc.

Factors Affecting Benefits and Costs

Figure 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:

- **Improvement in IT administrative effort when managing Cisco hardware.** A typical environment deployment and management scenario has a number of manual and repeatable tasks that can cause inconsistencies and errors. Those using the advanced technology features of UCS to automate and streamline their internal processes will experience commensurately larger gains with automation driving consistency and adherence to policies.
- **Reduction in endpoint costs.** Reducing the cost of worker endpoints was an important factor for the organizations interviewed. For the legacy environment, desktop configuration and software costs could vary depending on the application requirements, mobility demands, and the role of each user. Higher physical desktop costs and an increase in hardware diversity could further increase the ROI.
- **Reduction in power and cooling costs.** For this study, we estimated the number of servers retired with the workload virtualized on fewer and new, more powerful Cisco UCS servers. Organizations typically were not monitoring the incremental power and cooling costs that could have been realized by migrating to UCS.

Disclosures

The reader should be aware of the following:

- The study is commissioned by Cisco and delivered by the Forrester Consulting group.
- 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 report to determine the appropriateness of an investment in Cisco Desktop Virtualization Solutions.
- Cisco reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.
- The customer names for the interviews were provided by Cisco, but Cisco did not participate in any of the customer interviews.

TEI Framework and Methodology

Introduction

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ framework for those organizations considering implementing Cisco Desktop Virtualization Solutions (e.g., VDI). 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 [Cisco Desktop Virtualization Solutions](#) can have on an organization (see Figure 2). Specifically, we:

- Interviewed Cisco marketing and sales management and Forrester analysts to gather data relative to Cisco Desktop Virtualization Solutions and the marketplace for desktop virtualization.
- Interviewed four organizations currently using Cisco Desktop Virtualization Solutions 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 Cisco Desktop Virtualization Solutions deployments:

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 interviews were conducted for this study, involving representatives from the following companies:

1. Large financial institution based in India.
2. Large financial institution based in the United Kingdom.
3. Regional educational institution based in the United States.
4. Regional healthcare organization based in Australia.

The four interviews revealed that Cisco customers benefitted from the Cisco Desktop Virtualization Solutions through:

- **Increased worker productivity, fewer downtime issues, and fewer workforce interruption instances.** The interviewed organizations realized an increase in worker productivity and fewer downtime issues after migration, with better hardware uptime and system recovery. In addition, these organizations also identified certain roles — for example, a back-office user community that spends most of its time using basic Office productivity tools such as Outlook, Word, and Excel — that have fewer system requirements and their type of usage is relatively predictable.
- **Reduced capital costs.** The interviewed organizations were able to deliver inexpensive and richer experiences, with virtual desktops, to those users in back-office environments or those with limited application usage. For the interviewees, the vast majority of the workers using VDI fit that profile of user. This means that the “offered” virtual desktop infrastructure is reasonably small and as a result, the infrastructure cost of that desktop is relatively low.

- **Reduced support costs and fewer desk-side support visits.** All four of our interviewees believed that managing support issues was an integral part of the solution investigation. These organizations serve users across multiple locations and geographies, and they recognized that by implementing Cisco Desktop Virtualization Solutions they were able to reduce failure rates significantly and avoid endpoint security and system-failure-related issues. The IT staffs were no longer required to travel to various locations to address user issues; they could instead do it all remotely. In addition, there is no software distribution requirement to individual endpoints which may or may not be connected to the corporate network. Furthermore, there is no need to update operating systems or do patching on endpoints. In that sense, this migration has reduced the operation support activities significantly. This solution has also allowed these organizations to better manage third-party contractors and improve their employee onboarding speed and experience. Our interviewees also mentioned that they have identified stronger business continuity and disaster recovery processes that can be created around this deployment.
- **Improved power savings.** A number of interviewees mentioned that they now have the ability to reduce endpoint and phone energy consumption by putting devices to sleep remotely. While they have not taken advantage of this option and were unable to comment on specific value gained, they have the control to automatically switch devices off when they are not being used via policy or schedule. This could lead to further savings when implemented.

Composite Organization

Based on the interviews with the four existing customers provided by Cisco, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas that are financially affected. The composite organization that Forrester synthesized from these results represents an organization with 2,000-seat licenses.

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)		2,080
A4	Average fully loaded salary		\$100,000
A5	Average fully loaded hourly rate	(A4/A3)	\$48

Source: Forrester Research, Inc.

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

Costs

This section outlines the cost for the implementation of Cisco Desktop Virtualization Solutions for the composite organization over a five-year period. Cisco provided estimates for the hardware and maintenance cost for the 2,000 user organization. Forrester validated the components of the hardware bundle and ongoing maintenance with the interviewed organizations. Cisco price estimates, as well as, third-party virtualization software and storage estimates are based on list price and do not include any negotiated pricing or standard discounts.

Based on interviews with four existing Cisco Desktop Virtualization Solutions customers, we also estimate the internal resources allocated to planning, testing, and implementation, as well as the investment in professional services to ensure a successful implementation.

Total Cisco Hardware and Annual Maintenance Costs

This category shows the license and annual support costs to implement Cisco Desktop Virtualization Solutions. Cisco provided the total costs for the 2,000-seat organization. Cisco components primarily comprise UCS hardware.

Table 3

Total Cisco Hardware Costs

Ref.	Metric	Calculation	Initial
B1	Infrastructure server bundle		\$642,981
Bt	Total Cisco hardware costs	B1	\$642,981

Source: Forrester Research, Inc.

Table 4

Total Cisco Annual Maintenance Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
C1	UC PLUS 24X7X4 UCS 5108 Blade Server AC Chassis			\$193	\$193	\$193	\$193	\$193
C2	UC PLUS 24X7X4 UCS 6248 FABRIC INTERCONNECT			\$2,416	\$2,416	\$2,416	\$2,416	\$2,416
C3	UC SUPPORT 8X5XNBD UCS B200 M3 Blade Server			\$366	\$366	\$366	\$366	\$366
C4	UC PLUS 24X7X4 UCS B200 M3 Blade Se			\$2,646	\$2,646	\$2,646	\$2,646	\$2,646
C5	SP AR HW 24X7X4 Nexus 5548 Storage Solutions Bundle 16			\$7,260	\$7,260	\$7,260	\$7,260	\$7,260
C6	UC PLUS 24X7X4 5108 Blade Server Chassis			\$193	\$193	\$193	\$193	\$193
Ct	Total Cisco annual maintenance costs	C1+C2+C3+C4+C5+C6	\$0	\$13,074	\$13,074	\$13,074	\$13,074	\$13,074

Source: Forrester Research, Inc.

Third-Party Desktop Software and Storage Cost Estimates

Another component of cost is the software and storage costs required of virtual desktops and applications. Our interviewees have invested in third-party software for desktop virtualization and storage resources to fully implement Cisco Desktop Virtualization Solutions. These estimates are based on discussions with customers interviewed for this study. These organizations negotiated separately with vendors offering desktop virtualization software and storage solutions and integrated the UCS solution with their existing storage.

For the composite organization, we estimate that the total investments in terms of license and upfront capital cost are divided 42% for Cisco hardware, 26% for desktop virtualization software, and 32% for storage solutions. We estimated that the composite organization would spend 14% of desktop virtualization software cost and 15% of desktop virtualization storage costs on annual maintenance.

Table 5

Third-Party Desktop Software and Storage Cost Estimates

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
D1	Total desktop virtualization cost		\$1,543,000					
D2	Percent of investment allocated to third-party desktop software virtualization costs		26%	14%	14%	14%	14%	14%
D3	Percent of investment allocated to desktop virtualization storage costs		32%	15%	15%	15%	15%	15%
Dt	Third-party desktop software virtualization and storage cost estimate	$D1*(D2+D3)$	\$894,940	\$130,229	\$130,229	\$130,229	\$130,229	\$130,229

Source: Forrester Research, Inc.

Internal Implementation Costs

This category represents customers' internal efforts associated with the implementation of Cisco Desktop Virtualization Solutions. The interviews with the four existing customers revealed that these organizations initially deployed Cisco UCS hardware to improve the performance challenges they faced with their prior infrastructure and to accommodate their growing desktop virtualization needs. During the planning and implementation phase, they spent time to ensure that UCS accommodated their computing demand and allowed their teams to maximize their existing resources.

We estimate that the organization allocated 40% of eight IT infrastructure and desktop administrative staff resources for 100 days for the planning, testing, and implementation phase. Table 6 represents the breakdown of costs for the composite organization.

Table 6

Internal Resources Allocated To Planning, Testing, and Deployment

Ref.	Metric	Calculation	Initial
E1	Number of people		8
E2	Number of days spent testing and planning		100
E3	Number of hours per day		8
E4	Average fully loaded hourly rate		\$48

Ref.	Metric	Calculation	Initial
E5	Percent of time allocated		40%
Et	Internal implementation costs	$E1 * E2 * E3 * E4 * E5$	\$122,880

Source: Forrester Research, Inc.

Professional Services Costs

This category represents the professional services costs associated with the deployment of Cisco Desktop Virtualization Solutions. The organizations interviewed used external resources to support their implementation efforts. Depending on the complexity of the customer's environment and the skill set of its staff, these organizations used professional services to support some combination of initial planning and implementation.

Table 7 illustrates the investment in this category by the composite organization. The cost is estimated based on daily rate of \$1,000. We estimated that two consultants would be allocated for 30 days on planning and implementation.

Table 7

Professional Services Costs

Ref.	Metric	Calculation	Initial
F1	Number of people		2
F2	Average daily rate		\$1,000
F3	Number of days spent on implementation and support		30
Ft	Professional services costs	$E1 * E2 * E3$	\$60,000

Source: Forrester Research, Inc.

Total Costs — Non-Risk-Adjusted

Table 8 summarizes the investment in Cisco Desktop Virtualization Solutions and its related planning and implementation costs.

Table 8

Total Costs — Non-Risk-Adjusted

Ref.	Cost category	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Bto	Total Cisco hardware costs	(\$642,981)	\$0	\$0	\$0	\$0	\$0	(\$642,981)	(\$642,981)
Cto	Total Cisco annual maintenance costs	\$0	(\$13,074)	(\$13,074)	(\$13,074)	(\$13,074)	(\$13,074)	(\$65,370)	(\$49,561)

Ref.	Cost category	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Dto	Third-party desktop software virtualization and storage cost estimate	(\$894,940)	(\$130,229)	(\$130,229)	(\$130,229)	(\$130,229)	(\$130,229)	(\$1,546,086)	(\$1,388,611)
Eto	Internal implementation costs	(\$122,880)	\$0	\$0	\$0	\$0	\$0	(\$122,880)	(\$122,880)
Fto	Professional services fees	(\$60,000)	\$0	\$0	\$0	\$0	\$0	(\$60,000)	(\$60,000)
	Total costs (Original)	(\$1,720,801)	(\$143,303)	(\$143,303)	(\$143,303)	(\$143,303)	(\$143,303)	(\$2,437,317)	(\$2,264,033)

Source: Forrester Research, Inc.

Benefits

This category represents the benefits derived from the implementation of Cisco Desktop Virtualization Solutions for the composite organization. The organizations interviewed implemented Cisco Desktop Virtualization Solutions to move away from legacy physical desktop infrastructure while addressing the following challenges:

- Extend the life of existing endpoints and/or migrate to lower-cost, lower-risk thin, or zero clients.
 - Improve employee satisfaction and support more flexible remote access.
 - Support more flexible work styles and enable employees to connect to work resources from personal devices (BYOD).
 - Increase user productivity and support fewer downtime issues/fewer workforce interruption instances.
 - Reduce setup time (onboarding) for new employees.
- Lower ongoing management and support costs and reduce desk-side support visits.
- Reduce data center management costs by improving data security and centralization, and by simplifying or automating patch management.
- Improve data security at the endpoints.

Our interviewees also noted that the cost per headcount could be significantly reduced for particular roles within the organization. For example, back-office workers or those whose job primarily is limited to a small set of applications could migrate to thin or zero clients immediately.

For the composite organization, we identified IT operational costs savings and IT capital reductions. IT operational cost savings included increases in staff productivity gains resulting from system performance improvement and the

reduction in effort to manage initial and ongoing desktop environments. IT capital reductions included savings from thin and zero client implementations versus the prior environment's physical desktops, as well as the reduction in the number of server refreshes required.

Desktop Cost Savings

Customers interviewed reported that by migrating to thin clients or zero clients, they have been not only able to reduce the cost of acquisition but also extended the life of their hardware. For the interviewed organizations, prior to migration, physical desktop hardware would have cost on average \$850 and the software could have added an additional \$150 to \$250 per user. After migration, the thin client/zero client combination would cost anywhere from \$100 to \$350 per user. These organizations also estimated three- to four-year hardware refresh schedules for physical hardware and seven- to 10-year hardware refresh schedule for thin clients/zero clients, due to lower breakage rates because there are no spinning parts, such as hard drives and fans on the thin/zero clients.

For the composite organization, we estimated that for 2,000 users, the organization used to invest a total of \$1,000 per headcount. By moving to a thin or zero client environment the organization's cost was reduced to \$200 per headcount. Table 9 illustrates the calculation.

Table 9

Desktop Cost Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
G1	Average physical desktop cost			\$1,000	\$0	\$0	\$0	\$1,000
G2	Average thin/zero client desktop cost			\$200	\$0	\$0	\$0	\$0
G3	Total number of users			2,000	2,000	2,000	2,000	2,000
Gt	Desktop cost savings	$(G1-G2)*G3$	\$0	\$1,600,000	\$0	\$0	\$0	\$2,000,000

Source: Forrester Research, Inc.

Reduction in Future IT Growth Headcount and IT Staff Performance Improvement

Interviewed organizations stated that as a result of automating a number of patching and ongoing support tasks, they have been able to see two types of savings.

First, they have been able to reduce the projected increase in headcount budgeted for administrative staff. This allowed the organizations to allocate the added headcount to more strategic initiatives. We estimate that the composite organization has been able to reduce headcount by two in Year 1 and two in Year 4. Table 10 illustrates this calculation.

Table 10

Reduction in Future IT Growth Headcount

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
H1	Headcount reduction			2	0	0	2	0
H2	Average annual fully loaded salary			\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Ht	Reduction in future IT headcount growth	H1*H2	\$0	\$200,000	\$0	\$0	\$200,000	\$0

Source: Forrester Research, Inc.

Second, a portion of the cost savings is derived from performance improvements with the existing IT staff when implementing Cisco Desktop Virtualization Solutions. The organizations interviewed have been able to reduce the overall number of blade servers because of improved performance and higher computing power. These organizations believed their teams were also able to reduce ongoing management efforts by 20% to 30%.

For the composite organization, we assume eight IT staff dedicated to system architecture and infrastructure management with an average annual fully loaded salary of \$100,000 each and that they would experience a 20% performance improvement. To remain conservative, we estimated that this group would only allocate 75% of this time saving to other strategic initiatives. Table 11 demonstrates this calculation.

Table 11

IT Staff Performance Improvement

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
I1	Number of workers			8	8	8	8	8
I2	Annual fully loaded salary			\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
I3	Performance improvement that impacted IT staff productivity			20%	20%	20%	20%	20%
I4	Percent of time savings utilized			75%	75%	75%	75%	75%
It	IT staff performance improvement	I1*I2*I3*I4	\$0	\$120,000	\$120,000	\$120,000	\$120,000	\$120,000

Source: Forrester Research, Inc.

Server Refresh Cost Savings

This portion of the investment made in Cisco UCS was allocated to refresh of fully depreciated server hardware. The customers interviewed explained that they had coordinated their purchasing decision with their hardware refresh cycle. This means that the savings are the result of higher computing power when using Cisco UCS hardware without any

investment recapture for their fully depreciated older servers. As a result, these organizations shifted their investment budget to replace the traditional hardware with Cisco UCS.

For the composite organization, we estimate the organization reduced their server count by 20, with an average server acquisition cost of \$8,500. Table 12 shows the calculation.

Table 12

Server Refresh Cost Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
J1	Number of physical servers reduced					20		
J2	Average cost per server					\$8,500		
Jt	Server refresh cost savings	H1*H2	\$0	\$0	\$0	\$170,000	\$0	\$0

Source: Forrester Research, Inc.

Data Center Space Cost Savings

Our interviewed organizations reduced the total number of physical hardware components and better designed the space configuration using Cisco UCS hardware, and at the same time they increased their computing capacity. Creating space within the existing data center and increasing computing capacity, while reducing power consumption and cooling costs, was an important benefit to our interviewees. It eliminated the need to add more floor space to their data centers, either expansion on-premises or to an outside location. Both options would have mandated additional setup and management costs and would have increased the cost for all the projects. The cost avoidance savings generated by not needing a new data center, was not included in this analysis. To be more conservative, only the actual space savings associated with implementing Cisco UCS hardware was included for the purposes of this analysis, since this was considered a benefit attainable by all customers. Cisco UCS allowing organizations to refresh their existing hardware, simplify their environments, and reduce potential real estate expenses were significant benefits.

We estimate that the composite organization reduced their data center footprint by 24 square feet. With an average cost per square footage of \$1,250, we calculate that the composite organization is saving \$30,000 annually (24*\$1,250). Table 13 represents this calculation.

Table 13

Data Center Space Cost Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
K1	Average data center space saved (square footage)			24	24	24	24	24
K2	Average data center square footage cost			\$1,250	\$1,250	\$1,250	\$1,250	\$1,250
Kt	Data center space cost savings	$K1 * K2$	\$0	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000

Source: Forrester Research, Inc.

Power and Cooling Cost Savings

This benefit measures the difference in power and cooling costs when eliminating 20 physical servers. Using Forrester Research “Data Center Power Cost Calculator,” we estimate the cost savings associated with this reduction.² Table 14 represents this calculation.

Table 14

Power and Cooling Cost Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
L1	Number of physical servers reduced					20		
L2	Average kilowatts US server consume					0.322		
L3	Average cost per KWH					0.11		
L4	Number of hours in the year					8,760		
L5	Cooling factor					1.8		
L6	Percent of benefit captured					75%	100%	100%
Lt	Power and cooling cost savings	$L1 * L2 * L3 * L4 * L5 * L6$	\$0	\$0	\$0	\$8,378	\$11,170	\$11,170

Source: Forrester Research, Inc.

Desktop Administrator Productivity Improvement and Initial Hardware Refresh And Ongoing Management

The final aspect of our benefit analysis is the IT desktop administrators' productivity improvements. Organizations interviewed said that migrating to thin and zero clients has allowed their IT staff to realize two types of savings. First is the ability to complete system refreshes faster, speed and improve new employees' onboarding, and better manage access of third-party contractors to corporate assets and applications.

The interviewed organizations estimated that they realized between two and four hours of savings per desktop with thin/zero client versus when they refreshed their old physical desktops clients. We estimated that the composite organization had a four-year desktop refresh cycle. During refresh cycles, we estimated that IT administrators allocated two hours per desktop upgrade. We assumed \$48 as the average fully burdened hourly rate for an IT administrator. To remain conservative, we estimated that this group allocated only 75% of the time savings to other strategic initiatives. Table 15 demonstrates this calculation.

Table 15

Desktop Administrator Productivity Improvement

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
M1	Number of workers			2,000	2,000	2,000	2,000	2,000
M2	Hourly rate per person			\$48	\$48	\$48	\$48	\$48
M3	Number of hours saved			2	0	0	0	2
M4	Percent captured			75%	75%	75%	75%	75%
Mt	Desktop administrator productivity improvement	$G1 * G2 * G3 * G4$	\$0	\$144,000	\$0	\$0	\$0	\$144,000

Source: Forrester Research, Inc.

The second part of the benefit results from the reduction of ongoing maintenance and support costs. The interviewed organizations reported that the decrease in the number of desk-side visits and ongoing system repairs, due to migrating to the thin and zero clients, further reduced the reactive pressure on IT staff necessary to keep end users productive.

For the composite organization, we estimate that 40% of 2,000 workers experienced various desktop failures that required either IT desk-side visits or workers were required to drop their equipment at an IT office. Based on interviews with the four customer organizations, we assumed that it required one hour to address each issue. This means that when the IT staff takes on a support case, the end user will either get a replacement or remain unproductive for the duration of this period. To remain conservative, we estimate that the composite organization will only realize 50% of the savings generated by adopting desktop virtualization solutions with thin/zero clients. Table 16 represents the calculation.

Table 16

Ongoing Desktop Management Productivity Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
N1	Percentage of worker require assistance with their physical desktop				40%	40%	40%	
N2	Total number of workers				2,000	2,000	2,000	
N3	Hourly rate per person				\$48	\$48	\$48	
N4	Number of hours saved				1	1	1	
N5	Number of people involved (one IT and one worker)				2	2	2	
N6	Percent captured				75%	75%	75%	
Nt	Ongoing desktop management productivity savings	$N1*N2*N3*N4*N5*N6$	\$0	\$0	\$57,600	\$57,600	\$57,600	\$0

Source: Forrester Research, Inc.

Total Benefits — Non-Risk-Adjusted

Table 17 summaries the total quantitative benefits associated with the implementation of Cisco Desktop Virtualization Solutions.

Table 17

Total Benefits — Non-Risk-Adjusted

Ref.	Benefit category	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Gto	Desktop cost savings	\$0	\$1,600,000	\$0	\$0	\$0	\$2,000,000	\$3,600,000	\$2,696,388
Hto	Reduction in future IT growth headcount	\$0	\$200,000	\$0	\$0	\$200,000	\$0	\$400,000	\$318,421
Ito	IT staff performance improvement	\$0	\$120,000	\$120,000	\$120,000	\$120,000	\$120,000	\$600,000	\$454,894
Jto	Server refresh cost savings	\$0	\$0	\$0	\$170,000	\$0	\$0	\$170,000	\$127,724

Ref.	Benefit category	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Kto	Data center space cost savings	\$0	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$150,000	\$113,724
Lto	Power and cooling cost savings	\$0	\$0	\$0	\$8,378	\$11,170	\$11,170	\$30,718	\$20,859
Mto	Desktop administrator productivity improvement	\$0	\$144,000	\$0	\$0	\$0	\$144,000	\$288,000	\$220,322
Nto	Ongoing desktop management productivity savings	\$0	\$0	\$38,400	\$38,400	\$38,400	\$0	\$115,200	\$86,814
	Total benefits (Original)	\$0	\$2,094,000	\$188,400	\$366,778	\$399,570	\$2,305,170	\$5,353,918	\$4,039,145

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into a business benefit for incremental 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. Multiple scenarios exist in which a customer might choose to simply implement Cisco Desktop Virtualization Solutions and later realize additional uses and business opportunities. Flexibility would also be quantified when it is considered and evaluated as part of a specific project (described in more detail in Appendix B).

The interviewed organizations stated, after completing their virtual desktop migration initiative, that they are considering Cisco’s voice and video capabilities that are available in conjunction with Cisco Desktop Virtualization Solutions to offer further flexibility to their users. Some desktop administrators also stated that with Cisco Desktop Virtualization Solutions, they’re now better able to keep pace with the “consumerization” demands by their workforces, such as the ability to support work-from-home scenarios, increased tablet adoption, extending Windows apps to non-Windows devices, more seamlessly support new operating systems and applications, sync content across multiple devices, support a BYOD program, as well as build out enterprise-grade application stores. Table 18 represents the framework for estimating future cost and benefits associated with this offering.

For this study, we interviewed four customers that stated the space savings in the data center reduced the need to either employ a co-op data center expense or migrate to a new space to accommodate the organizations’ growing need.

Table 18

Flexibility Benefit Framework

Metric	Measurement
Asset value (benefit)	IT or business costs avoided, increase in end user productivity, and revenue generated
Cost to acquire option	Planning, development, and testing costs to user Cisco Voice and Video offering
Expiration	Time-to-expire (in years)
Flexibility	Black-Scholes option pricing model
Metric	Measurement

Source: Forrester Research, Inc.

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 Cisco Desktop Virtualization Solutions 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 Cisco Desktop Virtualization Solutions, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes of the 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 dependable 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 since they represent the expected values, after accounting for these inherent risks—risk adjusted.

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

- Third-party resources needed during planning and implementation may vary from the estimates offered for the composite organization.
- The implementation costs could vary based on the internal skill set, IT staff competencies/expertise, and the state of the back-end infrastructure and network.

The following impact risks affect benefits and are identified as part of the analysis:

- The improvement in IT administrative effort could vary depending on the prior environment, number of applications being managed, and level of performance issues end users are experiencing.
- Additional hardware acquisition could vary, depending on the organization’s infrastructure and virtualization effort.

Table 19 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. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Table 19
Cost and Benefit Risk Adjustments

Costs	Low	Most likely	High	Mean
Total Cisco hardware costs	98%	100%	105%	101%
Total Cisco annual maintenance costs	98%	100%	105%	101%
Third-party desktop software virtualization and storage cost estimate	100%	100%	125%	108%
Internal implementation costs	98%	100%	105%	101%
Professional services fees	100%	100%	125%	108%

Benefits	Low	Most likely	High	Mean
Desktop cost savings	100%	100%	125%	108%
Reduction in future IT growth headcount	100%	100%	125%	108%
IT staff performance improvement	100%	100%	105%	101%
Server refresh cost savings	100%	100%	105%	101%
Data center space cost savings	100%	100%	125%	108%
Power and cooling cost savings	100%	100%	125%	108%
Desktop administrator productivity improvement	100%	100%	125%	108%
Ongoing desktop management productivity savings	100%	100%	125%	108%

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 return on investment, net present value, and payback period for the organization's investment in Cisco Desktop Virtualization Solutions. These are shown in table 20 below.

Table 20

Cash Flow — Non-Risk-Adjusted

Categories	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Costs	(\$1,720,801)	(\$143,303)	(\$143,303)	(\$143,303)	(\$143,303)	(\$143,303)	(\$2,437,317)	(\$2,264,033)
Benefits	\$0	\$2,094,000	\$188,400	\$366,778	\$399,570	\$2,305,170	\$5,353,918	\$4,039,145
Net benefits	(\$1,720,801)	\$1,950,697	\$45,097	\$223,474	\$256,267	\$2,161,867	\$2,916,601	\$1,775,112
ROI	78%							
Payback period	11 months							

Source: Forrester Research, Inc.

Table 21 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 19 in the Risk section to the cost and benefits numbers in Tables 8 and 17.

Table 21

Cash Flow — Risk-Adjusted

Categories	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	PV
Costs	(\$1,750,811)	(\$144,736)	(\$144,736)	(\$144,736)	(\$144,736)	(\$144,736)	(\$2,474,492)	(\$2,299,475)
Benefits	\$0	\$2,054,360	\$183,096	\$350,771	\$381,596	\$2,272,860	\$5,242,683	\$3,954,361
Net benefits	(\$1,750,811)	\$1,909,624	\$38,360	\$206,035	\$236,860	\$2,128,124	\$2,768,191	\$1,654,886
ROI	72%							
Payback period	11 months							

Source: Forrester Research, Inc.

Cisco Desktop Virtualization Solutions: Overview

The Cisco Desktop Virtualization Solutions are a core component of Cisco's Unified Workspace vision and Mobility strategy. According to Cisco, Cisco Desktop Virtualization Solutions enable IT to provide users with a productive, mobile and secure work environment anywhere on multiple devices through a set of proven, simplified and cost-effective data center infrastructures tailored to different delivery models, performance and scalability requirements. Cisco Desktop Virtualization Solutions address the challenges associated with:

- The proliferation of endpoint devices and mobile work environments.
- Complexity of enterprise desktop management: deployment, patching and upgrading.
- Windows migrations.
- Security, compliance, and business continuance challenges.
- Combination of virtual desktops with collaboration, voice and video with uncompromised user experience.
- Infrastructure, desktop, and communications administration costs.

To successfully deploy desktop and application virtualization, organizations need a comprehensive ecosystem that spans data center, network, and collaboration architectures, combined with any required planning, design and support services. The end result is a flexible, highly secure, and efficient infrastructure that meets a diverse set of user needs. Cisco and its partners offer a complete range of products, solutions, professional and technical services to plan, build and manage a successful deployment of desktop and application virtualization solutions.

For more information on Cisco Desktop Virtualization Solutions go to: www.cisco.com/go/vdi

To carry out your own desktop virtualization TCO study, speak to your Cisco representative.

Appendix A: Composite Organization Description

For this TEI study, Forrester has created a composite organization to illustrate the quantifiable costs and benefits of implementing desktop virtualization based on Cisco Desktop Virtualization Solutions. The composite company is intended to represent an organization with 2,000 employees and is based on characteristics of the interviewed customers. The prior environment consisted primarily of thick client, Windows-based desktops and laptops. Firms invested in Cisco Desktop Virtualization Solutions in order to deliver hosted desktops and applications for their increasingly distributed workforces at a lower cost than traditional PCs, while also improving collaboration experiences and enabling flexible work styles.

Prior to implementing Cisco Desktop Virtualization Solutions, the organization had virtualized its backend infrastructure. In purchasing Cisco Desktop Virtualization Solutions, the composite company has the following objectives:

- Reduce the time and effort associated with the ongoing management of a data center to focus resources on new and innovative projects without the need to expand personnel.
- Reduce power and cooling costs and the data center footprint while upgrading equipment and expanding to meet the memory and storage requirements.
- Extend the life of current desktops by either migrating to lower-cost or lower-risk thin/zero clients.
- Increase data security and centralization, and simplify patch management.
- Increase user productivity, reduce downtime and ensure fewer workforce interruptions.
- Improve employee satisfaction and provide more flexible remote access. Create flexibility by providing access to work resources from personal devices including mobile devices.
- Reduce support costs and fewer desk-side support visits.
- More easily support third-party contractors.
- Ensure strong business continuity and disaster recovery strategies.

For the purpose of the analysis, Forrester assumes that the composite organization has virtualized their data center prior to implementation of Cisco Desktop Virtualization Solutions.

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 enterprise wide 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.

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 23.

² Source: "Updated Q3, 2011: Power And Cooling Heat Up The Data Center," Forrester Research, Inc., September 21, 2011.