The Total Economic Impact™ Of Nutanix For End User Computing

Cost Savings And Business Benefits Enabled By Nutanix Hyperconverged Infrastructure For End User Computing

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ABOUT FORRESTER CONSULTING

Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit forrester.com/consulting.

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Key Benefits

Reduction in capital spending:
$13.7 million

Accelerated time to provision and scale end users:
$2.7 million

End user time savings:
$2.3 million

Extended device savings:
$1.5 million

Executive Summary

It's never been more important for end users to have consistent and reliable access to their applications and data. But managing large end point environments creates challenges, costs, and complexity for I&O professionals. Organizations undergoing an EUC transformation, adopting BYOD or CYOD policies, or pursuing digital transformation initiatives are ripe for a VDI deployment.[1] Forrester sees tremendous interest by infrastructure decision makers in moving VDI workloads to the public cloud or by running VDI in a hybrid environment, in order to reduce infrastructure costs and compensate for the lack of skilled IT staff that VDI requires. Unfortunately, many VDI projects stall, fail, or never get off the ground due to their complexity, cost, and poor user experience, which undermines why an organization turned to VDI in the first place.

Nutanix provides two solutions for end user computing that are built on its hyperconverged infrastructure: VDI and desktop-as-a-service (DaaS). Unlike previous VDI deployments built on traditional three-tier architecture (storage, networking, compute), customers use these virtual desktop options to quickly scale business operations, empower employees with secure access to desktops, apps, and data, and simplify infrastructure management. Built on Nutanix hyperconverged architecture, customers avoid the traditional three-tier architectural challenges, instead purchasing building blocks of dense storage, compute (CPU), and memory (RAM) to scale when needed.

Nutanix commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying a Nutanix solution for End User Computing. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the investment on their organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed several customers with years of experience using the Nutanix solution for End User Computing.

Prior to deploying virtual apps and desktops on Nutanix, customers had attempted small VDI deployments on-premises with traditional three-tier infrastructure. However, these attempts yielded limited success, leaving customers with a poor user experience, unpredictable availability and security, long planning and change cycles, and expensive upfront costs. The customers turned to Nutanix to address these problems.

Key Findings

Forrester constructed a composite organization representative of the interviewed Nutanix customers and found that the organization experiences benefits of $21.0 million over three years versus costs of $8.0 million, adding up to a net present value (NPV) of $13.0 million and an ROI of 164%.

Quantified benefits. The risk-adjusted present value (PV) benefits below are representative of those experienced by Nutanix customers.

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ROI
164%

Benefits PV
$21.0 million

NPV
$13.0 million

Payback
<6 months

Financial Summary

Payback
period:
<6 months

Total
benefits
PV,
$21.0M

Total
costs
PV,
$8.0M

Initial   Year 1   Year 2   Year 3
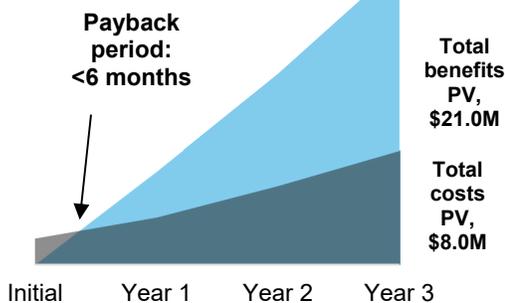
› **Excellent end user experience at scale saves 362,000 hours over three years.** Application proximity, UX consistency across devices, and the ability to access devices from anywhere improved both the user productivity and employee experience (EX). Over three years, and through recapturing 30% of productivity lift, the performance improvements are worth more than $2.3 million to the organization.

› **Hyperconverged infrastructure (HCI) vs three-tiered architecture saves millions, reducing capital expenditures by 25% to 35%.** Hyperconverged infrastructure blends ease of use, scalability, and integration into easily consumable building blocks. Over three years, and attributing 75% of the savings to Nutanix, the hardware savings are worth more than $13.7 million to the organization.

› **The adoption of thin devices along with the two-year extension of device refresh cycle drives savings.** VDI users can perform their roles using a thin device that refreshes every five years, instead of every three. Over three years, and after a cumulative total of 1,675 devices, the extended refresh cycle and adoption of thin devices is worth more than $1.5 million to the organization.

› **Simplified EUC management frees 1.75 to 3.25 FTEs.** Storage optimization technology efficiently uses available capacity, adjusts intelligently to adapt to workload characteristics, and eliminates the need for manual configuration and fine-tuning. Over three years the simplified management FTE savings are worth $681,000 to the organization.

› **VDI enables 90% faster device provisioning.** Elapsed time to provision a device is reduced from 120 hours to 12 hours. Over three years, and after a cumulative total of 3,859 devices, the shorter provisioning cycle is worth more than $2.7 million to the organization.

Costs. Nutanix customers experienced the following risk-adjusted PV costs:

› **Licensing of $3.6 million scales linearly as needs grow.** VDI per user is an alternative to capacity-based and appliance licensing options. It provides simple, transparent licensing for all VDI users, regardless of the underlying hardware. Over three years, licensing grows as VDI adoption spreads and totals $3.6 million for the organization.

› **Desktop virtualization licensing of $432 per user.** Customers require a desktop virtualization solution to sit on top of the VDI. Nutanix supports both Citrix Virtual Apps And Desktops and VMware Horizon. The organization pays its broker vendor $3.3 million over three years.

› **Implementation and training costs of under $500,000.** Professional services and six internal resources over six months implement Nutanix VDI. Initial and ongoing training support the internal efforts. Over three years, implementation and training cost the organization $468,327.

› **Four administrators dedicate 50% of their time to VDI administration.** Four resources share the upkeep and administration of the VDI environment. Over three years, administrative efforts cost the organization $656,529.

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TEI Framework And Methodology

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing Nutanix For End User Computing.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that Nutanix For End User Computing can have on an organization:

DUE DILIGENCE
Interviewed Nutanix stakeholders and Forrester analysts to gather data relative to End User Computing.

CUSTOMER INTERVIEWS
Interviewed five organizations using End User Computing to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION
Designed a composite organization based on characteristics of the interviewed organizations.

FINANCIAL MODEL FRAMEWORK
Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewed organizations.

CASE STUDY
Employed four fundamental elements of TEI in modeling Nutanix For End User Computing's impact: benefits, costs, flexibility, and risks. Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves to provide a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

> The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

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The End User Computing Customer Journey

BEFORE AND AFTER THE NUTANIX SOLUTIONS FOR END USER COMPUTING INVESTMENT

Interviewed Organizations

For this study, Forrester conducted five interviews with customers using the Nutanix solution for End User Computing. Interviewed customers include the following:

INDUSTRY	INTERVIEWEE	GEOGRAPHY	SIZE	EUC TYPE
Life sciences	Executive director, infrastructure operations and security	US headquarters, global operations	$12 billion revenue 70,000 employees	VDI
Life insurance	EUC architect	US headquarters, US and Mexico operations	$25 billion revenue 22,000 employees	VDI
Architecture	Senior solutions manager	US headquarters, global operations	$200 million revenue, 800 employees	DaaS
Financial services	Vice president, technology infrastructure	US headquarters, North America operations	$4 billion revenue 10,000 employees	VDI
Conglomerate	Senior director of IT	US headquarters, global operations	$110+ billion revenue 150,000+ employees	VDI

Key Challenges

The organizations cited several challenges in their prior environments that drove them to look for an end user computing solution.

› **Global spread of workers created delivery and management issues.** With organizations spanning the globe and employees working remotely, interviewees struggled to supply their employees in the best way possible. The executive director of infrastructure operations and security shared: "We had a requirement to bring a virtual desktop experience to users who were not at our physical sites, so they could access applications inside our data centers. The way we solved that problem was to mail laptops all over the world. That didn't make a lot of sense in many cases because those people already had some sort of device. So then they had two laptops sitting on their desks and folks didn't like that." When remote workers shuffled between devices, they faced frustrations when trying to do the same work across different devices and UX.

› **Previous VDI deployment attempts resulted in a poor end user experience.** For the three organizations that had previously attempted a VDI deployment, remote workers had a poor experience in terms of performance, security, support, and output management. The executive director shared: "We were using the [legacy] infrastructure to deliver a very hacked up VDI. We predominantly engineered that infrastructure to deliver single applications and not a full desktop. That experience wasn't good for anybody because we were using the wrong tool for the job."

› **Siloed teams produced administrative bottlenecks**. IT administrators faced process bottlenecks and challenges because of siloed infrastructures managed with different tools. The EUC architect shared: "Compatibility across the entire stack was a challenge, especially on the storage side. Since storage was siloed through a separate team, if we have any problems our time-to-resolution [gets] very high because there was a handoff to another team. So, we wanted to control it all."

› **Legacy infrastructure costs were front-loaded and inflexible.** The executive director noted that their previous VDI instance frequently hit max sessions and had limited elasticity. They shared, "It was really hard and very expensive to have infrastructure ready and waiting to scale."

Forrester's Perspective: 2020 Is The Year To Revisit Your Employee Technology Strategy

In May 2019, Forrester published "Five Key Trends That Will Reshape The Employee Technology Experience," which urges I&O professionals to devise new ways of working via cross-functional teams. Forrester Analyst Andrew Hewitt predicted: "The year 2020 will be a landmark one for I&O professionals. January 14, 2020 will mark the end of extended life support for Windows 7, and companies will finally need to face the reality of migrating to Microsoft's most recent operating system." He goes on to say, "Focusing solely on a Windows 10 migration is a missed opportunity to align your employee technology strategy to future employee needs." The report's five recommendations are:

1. Consider emerging PC form factors for relevant segments of your workforce.

2. Start a new management approach with basic modern management use cases.

3. Take a use-case-specific approach to virtualization.

4. Take a two-pronged approach to device refreshes.

5. Construct your mobile strategy to include frontline workers.

Indeed, 2020 did begin with a bang; Microsoft ended support for Windows 7 and the globe was struck by a pandemic. Either of these two events alone would have created a challenge for I&O professionals, but together they created a perfect storm, requiring I&O professionals to react quickly to the changing needs of the workforce, rapidly roll out remote access, and to rethink how technology impacts the employee experience and adaptability of a business.

This Forrester Perspective is supported by the following research: "Five Key Trends That Will Reshape The Employee Technology Experience."[2]

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Investment Objectives

Forrester asked interviewees what business goals an End User Computing investment might accomplish within their organizations.

› **Adapting for a future of business that is founded on remote work capability.** The most common reason that interviewees cited for reasoning behind an investment in the EUC was to futureproof their workforce. The interviews for this study were conducted in the early months of the COVD-19 global pandemic, and it was therefore top of mind for the interviewees. The senior solutions manager told Forrester: "We're entirely in a work-from-home situation now and I only see this going further, depending on how long this [pandemic] lasts. This will potentially change the way we work in the future, even after this whole thing is over." A similar sentiment was shared by the EUC architect: "Our goal is to be agile enough to handle something like we've run into the last six weeks. We want business continuity and the ability to have workers work from anywhere."

› **Accelerate delivery time to end users and centrally manage devices.** Managing endpoints is typically costly, time-consuming, and error prone. For the interviewed financial services organization, Nutanix EUC solutions provided an opportunity to modernize their PC model and provide a better EX. A VP of technology infrastructure told Forrester: "Our primary goal was faster delivery to end users. We've been using a distributed end user PC technology because we've lived with a branch environment forever. With Nutanix, we're looking at a better model where we can manage those PCs with less touch, and we would also have the ability to grow and expand."

What Is End User Computing (EUC)?

End user computing solutions are a set of technologies used to deliver secure access to applications on a variety of devices from any location. EUC comprises multiple technologies but the main two discussed in this study are:

1. **Server-hosted virtual desktop** infrastructure is a desktop delivery mechanism that hosts complete user desktop environments on remote services, where each desktop instance runs within a virtual machine (VM) on a hypervisor and shares the hardware resources (CPU, memory, storage, and network) of the server alongside other VMs.

2. **Cloud desktop** is a standardized service offering that deploys complete desktop environments and/or desktop applications to customers on demand and is delivered remotely, i.e., via hyperscale cloud or managed service provider (MSP). It's freely accessible by both IT administrators and end users through a self-service interface, employs pay-per-use billing, and provides workspaces and/or applications on demand.

The above definitions are sourced from the following Forrester research: "The Forrester Tech Tide™: Digital Workspace Tech For Employee App Enablement, Q2 2019."[3]

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Why Nutanix?

The interviewed organizations chose Nutanix as their EUC vendor for the following reasons:

› **Simplified management with a central point for maintenance.** Interviewees faced management constraints in their previous environments, and according to the executive director, "We recognized that we weren't going to be able to get a ton of headcount for support, and with Nutanix, everything is on one platform that we can maintain as a single point."

› **HCI was the most cost-effective option.** After evaluating available VDI options, interviewees found that the total cost of ownership (TCO) of Nutanix was more competitive than alternatives. The executive director told Forrester: "When we did the bake-off, Nutanix was a clear winner from a dollar's perspective. It was cheaper for acquisition and maintenance, and we also believed it to be much cheaper than supporting traditional three-tier architecture."

› **Nutanix provides exemplary service.** A key differentiator in the decision-making process was the level of support that Nutanix provides to its customers. The EUC architect shared: "To date, I've never worked with a company that is as good at service as Nutanix. I'm not saying they're perfect, but compared to any of the other technology vendors I've ever dealt with, they've been the most knowledgeable support staff."

› **Building blocks are a scalable consumption model.** For the VP of technology infrastructure, Nutanix was selected for its scalability. They shared: "Because of its cloud-like, on-premises consumption model, capacity planning is much easier. I can more granularly grow our clusters and resources vs when we were on a three-tier [architecture], I would have a storage array that I couldn't granularly upgrade or I had to add additional chassis and blades to grow. That was a challenge that Nutanix really helped with."

› **Nutanix platform is more than an EUC solution.** With growing technology stacks and point solution vendors adding complexity, interviewees saw the value in an enterprise platform. The VP of technology infrastructure said: "Nutanix is not just an end user computing environment. We're buying a versatile platform that allows us to run both end user computing and standard server-based computing technology."

> "Nutanix appealed to us due to the simplicity and the dream that they sold us, which turned out to be true. It's not often that folks turn up to sell something that actually does what they say it's going to do. And ultimately, the success that we've enjoyed for virtual desktop translated into deploying Nutanix for the entirety of our private cloud."
>
> *Executive director, life sciences*

> "While Nutanix isn't the cheapest thing in the world, I think vs setting up a three-tier environment that's as scalable and as robust is more expensive than a hyper-converged infrastructure."
>
> *Vice president of technology*

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Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization is representative of the five companies that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization that Forrester synthesized from the customer interviews has the following characteristics:

Description of composite. The global, $10 billion dollar services organization is headquartered in the United States; it has 25,000 total employees, of which 70% are candidates for virtual desktops.

Previous environment. The organization has previously explored VDI for limited use cases, relying on traditional on-premises, three-tier architecture and a traditional hypervisor. The previous virtual desktop delivered applications instead of a full desktop experience.

Deployment characteristics. The composite deploys Citrix Virtual Apps And Desktops on Nutanix. The composite initially rolls out VDI to 875 employees to test capabilities. The cumulative number of VDI users are 1,750, 2,756, and 3,859 in Years 1, 2, and 3, respectively.
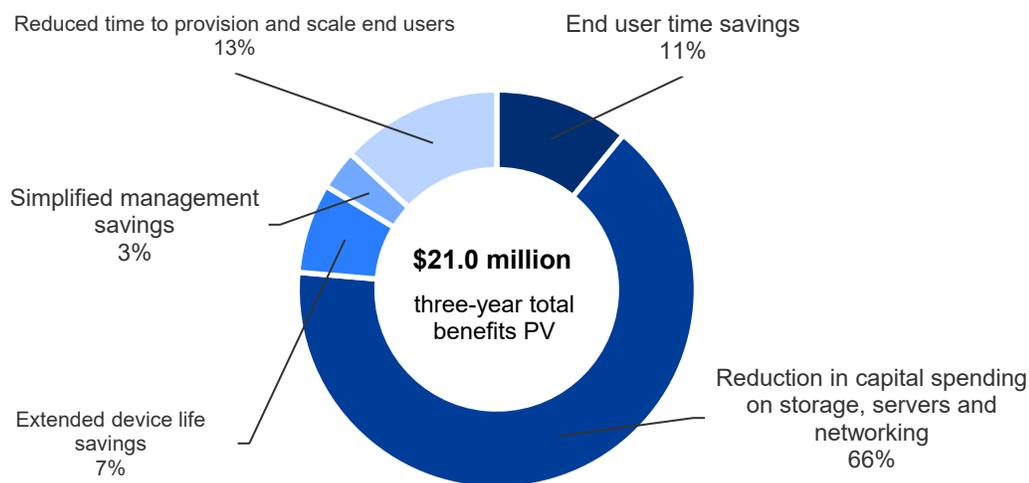
The financial analysis that follows is based on customer experiences and is constructed for a proxy composite organization.

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Analysis Of Benefits

QUANTIFIED BENEFIT DATA AS APPLIED TO THE COMPOSITE

Total Benefits

REF.	BENEFIT	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Atr	End user time savings	$593,775	$935,111	$1,309,359	$2,838,245	$2,296,355
Btr	Reduction in capital spending on storage, servers, and networking	$4,510,688	$5,575,210	$6,699,544	$16,785,441	$13,741,703
Ctr	Extended device life savings	$396,355	$625,090	$874,310	$1,895,755	$1,533,808
Dtr	Simplified management savings	$189,000	$297,000	$351,000	$837,000	$680,984
Etr	Reduced time-to-provision and scale end users	$1,479,870	$850,714	$932,741	$3,263,325	$2,749,188
	Total benefits (risk-adjusted)	$7,169,688	$8,283,124	$10,166,953	$25,619,765	$21,002,038

Reduced time to provision and scale end users 13%

End user time savings 11%

Simplified management savings 3%

Extended device life savings 7%

$21.0 million

three-year total benefits PV

Reduction in capital spending on storage, servers and networking 66%

Benefits (Three-Year)

$2.3M — End user time savings

$13.7M — Reduction in capital spending on storage, servers and networking

$1.5M — Extended device life savings

$681.0K — Simplified management savings

$2.7M — Reduced time to provision and scale end users

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End User Time Savings

End users experienced a productivity lift when using Nutanix VDI as a result of better proximity and performance. The executive director of a life sciences organization noted: "Looking at the geographically dispersed nature of our employees, we had challenges with applications functioning because somebody was on the other side of the world from where that application was hosted from. We've been able to use VDI to solve those problems."

The senior director of IT shared: "There had been performance challenges, like trying to access an application in North America from Asia Pacific. Now we have application proximity so when we give them a VDI in North America right next to the app it is much quicker for them. Therefore, 10 minutes a day is probably a very fair time savings estimate."

Other interviewees noted their employees saved time as a result of the VDI investment because they can work from anywhere, use their choice of device with the same user experience, and use single sign-on.

In addition to better performance, the VDI also had a positive impact on EX. See the Unquantified Benefits section for further discussion.

Modeling and assumptions. To capture the benefit realized by the interviewed organizations, Forrester assumes the following:

› In Year 1 of the investment, the total number of employees is 25,000. Each year the number of employees grows by 5%, through both organic and acquisition growth.

› Of the total employees, 70% are in roles that can potentially be migrated onto a VDI-driven machine.

› The composite organization migrates 10%, 15%, and 20% of VDI candidates onto VDI in Years 1, 2, and 3, respectively.

› VDI users save 10 minutes a day from better proximity and performance improvements over a 260-day work year.

› The average burdened hourly cost of a VDI user is $29.

› Forrester assumes that 30% of the time savings are captured, which adds value to the organization.

Risks. The impact of this benefit will vary by organization, depending on the prior environment and number of employees saving time with VDI. Organizations may choose to capture more than 30% of the productivity lift, or account for the benefit using other metrics like revenue production. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $2.3 million.

The table above shows the total of all benefits across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of more than $21.0 million.

Nutanix VDI improves performance, saving employees 10 minutes per day.

Impact risk is the risk that the business or technology needs of the organization may not be met by the investment, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for benefit estimates.

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End User Time Savings: Calculation Table

REF.	METRIC	CALCULATION	YEAR 1	YEAR 2	YEAR 3
A1	Number of total employees	Composite: 5% growth	25,000	26,250	27,563
A2	Percent of employees that are VDI candidates	Composite	70%	70%	70%
A3	Percent of employees on virtual desktop	Composite	10%	15%	20%
A4	Cumulative number of employees using VDI (rounded)	A1*A2*A3	1,750	2,756	3,859
A5	Minutes saved daily by VDI users	Interviews	10	10	10
A6	Number of workdays in a typical year	Assumption	260	260	260
A7	Hours saved annually	(A4*A5*A6)/60 mins	75,833	119,427	167,223
A8	Average burdened hourly cost of employees using virtual desktop (rounded)	$60,000/2,080 hours	$29	$29	$29
A9	Productivity recapture	Forrester assumption	30%	30%	30%
At	End user time savings	A7*A8*A9	$659,750	$1,039,012	$1,454,843
	Risk adjustment	↓10%			
Atr	End user time savings (risk-adjusted)		$593,775	$935,111	$1,309,359

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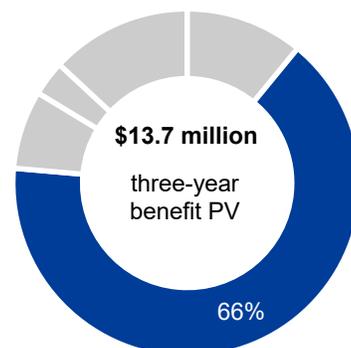# Reduction In Capital Spending On Storage, Servers, And Networking

A primary driver for the investment in Nutanix was to move away from the traditional three-tiered storage area networks and onto HCI. Interviewees noted that the HCI platform, on which the EUC environment is built, blends ease of use, scalability, and integration into easily consumable building blocks. With this simplicity, customers were able to reduce capital spending for storage, server, and networking purchases. The VP of technology infrastructure shared with Forrester: "One thing that has helped our resiliency is our ability to generate multiple clusters, bring them together, and allow balancing between them. In our old three-tier environment, we were constantly fighting for resource consumption and allocation. Whereas the Nutanix environment is more granular. Every time I add a Nutanix node, I get more storage, I get more processor, I get more memory. I don't have to allocate that across three different locations, I just get it in one place."

Another interviewee noted that as a result of the investment in Nutanix, they were able to downshift traditional storage arrays to a fraction of their legacy environment. The senior director of IT estimated, "We had at least 50% storage array reduction." After building an internal business case to justify the Nutanix solutions for the EUC investment, they calculated savings of 35%.

Modeling and assumptions. For the composite organization, Forrester assumes:

› The composite organization has a companywide IT budget of 3% of revenues or $300 million in Year 1 of the Nutanix investment. Each year thereafter gains a 3% year-over-year budget growth.

› Of the $300 million budget, 33% is earmarked for hardware purchases.

› Of the hardware budget, 27% is earmarked for capital expenses related to external storage, servers, and networking needs.

› As a result of moving onto Nutanix's hyperconverged infrastructure, the composite organization can decrease its spending on storage servers and networking by 25%, 30%, and 35% in Years 1, 2, and 3, respectively.

Risks. The reduction in capital spending will vary. Readers should consider the typical annual spending on storage, servers, and networking and the degree of companywide HCI adoption. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $13.7 million.

$13.7 million

three-year benefit PV

66%

Reduction in capital spending on storage, servers, and networking: 65% of total benefits

"Using Nutanix for end user computing enabled us to spend more FTE time on working with the business or to do better capacity planning, vs figuring out what storage array do I need to buy."

VP senior management director

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Reduction In Capital Spending On Storage, Servers, And Networking: Calculation Table

REF.	METRIC	CALCULATION	YEAR 1	YEAR 2	YEAR 3
B1	Companywide IT budget	3% of revenue, 3% YOY growth	$300,000,000	$309,000,000	$318,270,000
B2	Percent of IT budget dedicated to hardware purchases	Industry	33%	33%	33%
B3	Hardware budget	B1*B2	$99,000,000	$101,970,000	$105,029,100
B4	Percent of hardware budget spent on external storage, servers, and networking	Industry	27%	27%	27%
B5	Storage, server, and networking budget	B3*B4	$26,730,000	$27,531,900	$28,357,857
B6	Reduction in storage, server, and networking purchases as a result of Nutanix HCI	Interviews	25%	30%	35%
B7	Capital savings	B5*B6	$6,682,500	$8,259,570	$9,925,250
B8	Attribution to Nutanix	Assumption	75%	75%	75%
Bt	Reduction in capital spending on storage, servers, and networking	B7*B8	$5,011,875	$6,194,678	$7,443,937
	Risk adjustment	↓10%			
Btr	Reduction in capital spending on storage, servers, and networking (risk-adjusted)		$4,510,688	$5,575,210	$6,699,544

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Extended Device Life Savings

A Forrester study published in May 2019 reveals: "According to Forrester survey data, global infrastructure technology decision makers typically refresh laptops on a three-year cadence and tablets and smartphones on a two-year cadence. Seventy-six percent of them expect to replace company-owned laptops every three years or sooner, 80% expect as much for tablets, and 83% do so for smartphones."[4] Hardware refreshes of laptops and PCs can be staggering for companies with a large suite of endpoints. The VP of technology infrastructure told Forrester: "We will be able to extend the life of PCs [which are running VDI] past the normal three-year depreciation that we would normally put on them. This means our purchasing will change because I do not need all that horsepower sitting on somebody's desk anymore — a PC that would normally have lasted somebody three years because of software bloat and expansion. With VDI, that PC can now last four or five years." Extending the lifecycle of devices drove significant savings for the interviewees.

An additional avenue of savings enabled by the VDI investment is the migration to thin devices for employees running VDI. The VP of technology infrastructure noted: "We are deploying Chromebooks to [remote workers] and replacing their laptops. So, we're replacing a $1,500 device with a $300 device right now."
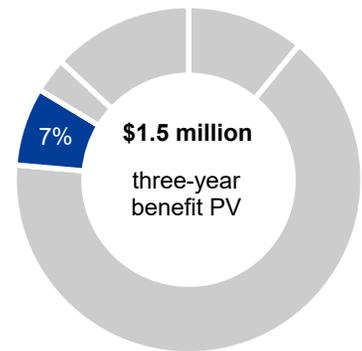
Modeling and assumptions. To capture the experiences of the interviewed organizations, Forrester makes the following assumptions:

› The number of devices in the legacy environment is calculated in Benefit A, and it equals the total number of employees multiplied by the percent of employees that are candidates for VDI. The model does not distinguish between PCs and laptops for the sake of simplicity, which thereby combines them into a single device category.

› The average cost for a PC/laptop device is $1,100.

› Before investing in the Nutanix solution for EUC, the composite organization refreshed their legacy devices every three years.

› After the investment, the employees with a VDI-enabled device (calculated in Benefit A) are migrated onto a thin device, which has a five-year refresh rate.
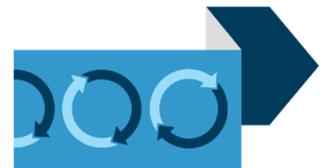
› A thin device costs $500.

Risks. The value of extended device life savings will vary by organization. Readers may consider:

› A company may choose to keep employees on traditional PCs rather than migrate them onto thin clients, in which case the savings would be reduced.

› Organizations that implement VDI for a portion of their employees that is larger than the composite organization may find greater savings across a larger population of VDI devices.

› Also, consider the more granular cost differences between laptops, desktops, thin devices, mobile devices, and tablets for a more precise benefit estimate.

To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of $1.5 million.

$1.5 million
three-year
benefit PV

7%

Extended device life savings: 7% of total benefits

Refresh rate extended from three- to five-years

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Extended Device Life Savings: Calculation Table

REF.	METRIC	CALCULATION	YEAR 1	YEAR 2	YEAR 3
C1	Number of existing PC/laptop devices	A1*A2	17,500	18,375	19,294
C2	Average cost per PC/laptop device	Interviews	$1,100	$1,100	$1,100
C3	Number of devices refreshed annually before Nutanix (rounded)	C1/3 (36-month refresh rate)	5,833	6,125	6,431
C4	Subtotal: Spending on refreshed devices before Nutanix	C2*C3	$6,416,300	$6,737,500	$7,074,100
C5	Number of devices running VDI	A4	1,750	2,756	3,859
C6	Number of devices refreshed annually with Nutanix and replaced with thin clients (rounded)	C5/5 (60-month refresh rate)	350	551	772
C7	Average cost of thin devices	Interviews	$500	$500	$500
C8	Spending on thin VDI devices	C6*C7	$175,000	$275,500	$386,000
C9	Number of traditional PC devices refreshed annually (rounded)	(C1-C5)/3 (36-month refresh rate)	5,250	5,206	5,145
C10	Refresh spending on remaining traditional devices	C2*C9	$5,775,000	$5,726,600	$5,659,500
C11	Subtotal: Spending on refreshed devices with Nutanix	C8+C10	$5,950,000	$6,002,100	$6,045,500
Ct	Extended device life savings	C4-C11	$466,300	$735,400	$1,028,600
	Risk adjustment	↓15%			
Ctr	Extended device life savings (risk-adjusted)		$396,355	$625,090	$874,310

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Simplified Management Savings

The Nutanix platform's storage optimization technology efficiently uses available capacity, intelligently adjusts to adapt to workload characteristics, and eliminate the need for manual configuration and fine-tuning. For the interviewed organizations, using a Nutanix solution for EUC saved significant efforts for both infrastructure and doing-business-as (DBA) teams.
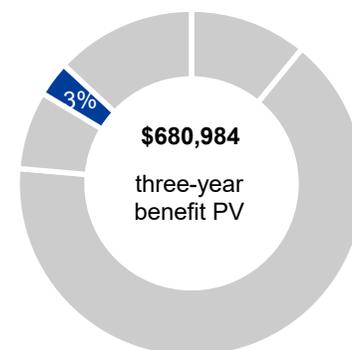
The EUC architect of a life insurance firm shared: "Now, from a performance standpoint, Nutanix has changed the game because we can leverage the tiered storage automatically behind the scenes and know that we're going to get the highest performance we can from our VDIs, depending on where we store them and how the data is used and cached." And the VP of technology infrastructure described: "Using Nutanix for end user computing enabled us to spend more FTE time on working with the business or to do better capacity planning, vs figuring out what storage array do I need to buy."

Modeling and assumptions. To capture the experiences of the interviewees, Forrester makes the following assumptions:

› The composite organization can reallocate 1.75, 2.75, and 3.25 resources in Years 1, 2, and 3, respectively, due to investing in a Nutanix solution for EUC.

› The burdened cost of an IT resource is $120,000.

Risks. Depending on the structure of an IT group and the number of IT resources in the prior environment, it is likely that an organization which adopts a Nutanix solution for EUC will experience an even greater productivity lift for their IT, DBA, and infrastructure teams. Readers should consider the burdened cost of these resources and the strategic impact that reallocating them to other tasks may create.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $680,984.

$680,984

three-year
benefit PV

Simplified management savings: 3% of total benefits

Simplified Management Savings: Calculation Table				
REF.	METRIC	CALCULATION	YEAR 1	YEAR 2	YEAR 3
D1	Number of FTEs reassigned to other tasks	Interviews	1.75	2.75	3.25
D2	Burdened cost of IT resource	Composite	$120,000	$120,000	$120,000
Dt	Simplified management savings	D1*D2	$210,000	$330,000	$390,000
	Risk adjustment	↓10%			
Dtr	Simplified management savings (risk-adjusted)		$189,000	$297,000	$351,000

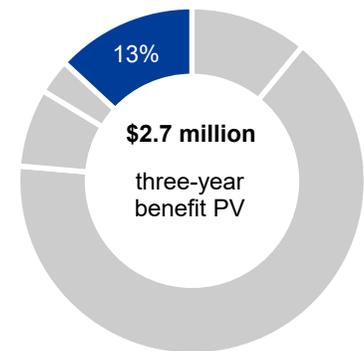FORRESTER®

Reduced Time To Provision And Scale End Users

While only comprising 13% of total benefits, the ability to quickly scale and provision VDI instances was the most lauded benefit of the Nutanix investment. The executive director told Forrester: "The way that the platform grows and scales allows us to add users in a very predictable way, such that we don't need to make huge investments to be able to grow; we just continue to add blocks into the environment and those blocks are consumed by new users coming onto the platform." The most measurable impact of this scalability is the reduced elapsed time to provision devices for end users. The senior director of IT shared: "There's performance and management benefits, and then there's delivery benefits. When we give somebody a traditional laptop, there is certainly lead time. Because of our global nature, even though we've got depos around the world, just shipping people laptops and all the administration behind buying and provisioning them takes a long time. Whereby within moments, we can deliver a VDI to a new user coming online."

Modeling and assumptions. To capture the experiences of the interviewed organizations, Forrester makes the following assumptions.
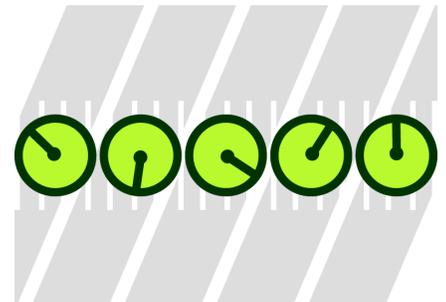
› This benefit captures the time saved when deploying a virtual desktop. The number of desktops provisioned are calculated in Benefit A.

› In the prior environment, the elapsed time to provision a device was 120 hours or three weeks.

› After the investment in a Nutanix solution for EUC, that provisioning time is decreased by 90%, saving 108 hours of elapsed time for each device provisioned.

› With faster deployment, knowledge workers can become productive in a fraction of the time, and therefore Forrester has used their salary to capture the financial value of reducing the elapsed provisioning time. The burdened cost of a knowledge worker is $29.

› Forrester assumes that 30% of the time savings are used in a productive way.

Risks. The value of reduced time-to-provision will depend on the number of VDIs that are annually deployed and the elapsed time to provision a device in the legacy environment. Organizations could also think about this benefit in terms of the additional revenue delivered, or service provided, by the knowledge worker who is using VDI.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $2.7 million.

13%

$2.7 million

three-year
benefit PV

Reduced time to provision and scale end users: 13% of total benefits

VDI delivery time reduced by 90%

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Reduced Time To Provision And Scale End Users: Calculation Table

REF.	METRIC	CALCULATION	YEAR 1	YEAR 2	YEAR 3
E1	Number of devices provisioned annually	A4 incremental	1,750	1,006	1,103
E2	Elapsed hours for device set up and delivery in prior environment	3 weeks	120	120	120
E3	Reduction in time-to-provision	Interviews	90%	90%	90%
E4	Elapsed hours saved for device set up and delivery using VDI	E2*E3	108	108	108
E5	Average burdened cost of knowledge worker (rounded)	$60,000/2,080 hours	$29	$29	$29
E6	Productivity recapture	Assumption	30%	30%	30%
Et	Reduced time to provision and scale end users	E1*E4*E5*E6	$1,644,300	$945,238	$1,036,379
	Risk adjustment	↓10%			
Etr	Reduced time to provision and scale end users (risk-adjusted)		$1,479,870	$850,714	$932,741

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Unquantified Benefits

In addition to the five benefits quantified above, there are additional benefits which could not be quantified for this study but were nonetheless considered measurements of success for the Nutanix investment.

› **Local file security reduces risk of data exfiltration.** Security was top-of-mind for several interviewees, and it was noted that a virtual desktop allows users to access company data without storing data on a local device, thereby reducing risk of data exfiltration. Administrators can control end user access using authentication and authorization technologies, ensuring that the right information is available to only the right users. Improved security abilities can lead to loss prevention savings in both FTEs for data management.

› **Virtual desktops improved EX.** Benefit A quantifies the productivity lift for end users, and in addition, using VDI improved EX. According to Forrester, employee engagement is the outcome of a continued positive EX. A key driver of EX is the ability to get meaningful work done, and according to Forrester's Employee Experience Index (EXi), technology-related factors play a significant role in enabling employees to do their best work.[5]

› **Disaster recovery and reliability of the Nutanix platform**. Interviewees praised the reliability of the Nutanix platform. The executive director told Forrester: "We are geographically dispersed because it provides us with some disaster recovery options in case we lose the data center where the biggest footprint of our VDI is delivered from. We can relocate to other data centers. But the Nutanix platform has been extremely reliable and we have not had any sort of extended outages. Superstitions aside, it's been very stable."

› **The Nutanix team provided exemplary service.** Interviewees repeatedly applauded the quality and extent to which Nutanix provides service. The EUC architect told Forrester: "There is seriously impressive talent over at Nutanix. When we are in a jam, we call them. They've got some smart people and they continue to be engaged with us and they'll stay with us for a few days just to make sure everything is working. I can't say enough good things about them."

› **Building block nodes allowed for scaling at will**. Nutanix's node-based infrastructure allowed customers to grow infrastructure as needed, rather than investing heavily up front for projected growth needs. The EUC architect shared: "Our ability to add capacity as needed has been brightly sped up. In our legacy environment, if we had known that we were going to be adding 500 more users, we would've needed three times the lead time to get that prepared for service. Whereas, with hyperconverged cluster expansion, nodes have made our support team's job much simpler. Once the equipment is racked and stacked, cluster expansion is a single click."

Unquantified benefits contribute to the success of VDI deployment.

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Flexibility

The value of flexibility is clearly unique to each customer, and the measure of its value varies from organization to organization. There are multiple scenarios in which a customer might choose to implement the Nutanix solution for End User Computing and later realize additional uses and business opportunities, including:

› **New use cases for virtual desktops.** The executive director told Forrester: "Nutanix has allowed us to grow our environment from very small up to a 5,000-user use case. The architecture team is constantly exploring other opportunities to push additional workload in that direction." Seasonal, remote, and call center workers are just a small number of opportunities for VDI deployments.

› **Explore the Nutanix Frame and DaaS model.** Organizations using VDI may look at Nutanix's DaaS product, Frame, to help simplify the tech stack by eliminating broker and hypervisor vendors.

Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix A).

> Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for a 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.

> "We've been extremely pleased with the deployment of Nutanix to host our virtual desktop use cases. It was very low touch, has very low operational overhead, and it does all the things that we expected."
>
> *Executive director, life sciences*

End User Computing In The Time Of COVID-19

The interviews for this study took place during the first few months of the COVID-19 global pandemic. With the help of Nutanix, the organizations were able to quickly respond to safety guidelines and adapt their workforce to remote work. The EUC architect of a life insurance firm told Forrester: "Nutanix has certainly helped us react to the COVID crisis because we were able to ramp up home users very quickly. We usually run pretty lean for capacity on our virtual desktop environment because it is easy to expand pretty quickly. Excluding the order time, once these blocks get inserted into the environment, it literally takes two days. So, we were able to rapidly expand our environment capacity to try to handle some more of the COVID-19 workload."

Amidst a pandemic and the uncertainty it created, the EUC architect noted that their investment in VDI gave the organization the ability to securely add remote resources, maintaining business continuity while other organizations floundered. The EUC architect shared: "If you look at the built-in business continuity VDI gives us, it's unbelievable. People can work from anywhere on any device. We really don't have to worry about data exfiltration. In a crisis like this, we literally can bring on as many people as needed."

Analysis Of Costs

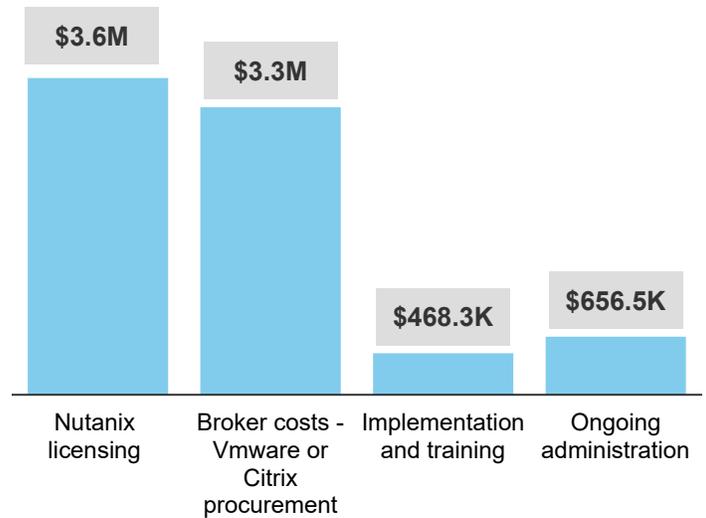**QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE**

	Total Costs						
REF.	COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Ftr	Nutanix licensing	$942,240	$942,240	$1,083,360	$1,187,400	$4,155,240	$3,586,272
Gtr	Broker costs – VMware or Citrix procurement	$415,800	$415,800	$1,309,651	$1,833,797	$3,975,048	$3,253,915
Htr	Implementation and training	$463,250	$2,042	$2,042	$2,042	$469,374	$468,327
Itr	Ongoing administration	$0	$264,000	$264,000	$264,000	$792,000	$656,529
	Total costs (risk-adjusted)	$1,821,290	$1,624,082	$2,659,053	$3,287,238	$9,391,662	$7,965,043

Nutanix Licensing

The VDI per user model offers product entitlement for Nutanix products AOS, AHV, and Prism with pricing on a per concurrent user basis. VDI per user is an alternative to capacity-based and appliance licensing options, and it is designed to provide simple, transparent licensing for all VDI users, regardless of the underlying hardware.

The senior solutions manager told Forrester: "The ongoing licensing costs are definitely increasing because 'you pay as you go and pay as you grow.' So, now that we're using it more than we used to, the cost is growing with us. But we're okay with that, and that's almost expected. It definitely beats the burden of supporting other kinds of environments."

Modeling and assumptions. Based on the costs incurred by the interviewed organizations, Forrester makes the following assumptions for the composite model.

> The table above shows the total of all costs across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to be a PV of $8.0 million.

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- The composite organization purchases nodes to support concurrent VDI users and assumes 70 concurrent users (not shown in calculation below). The number of users is calculated at Benefit A.

- Nutanix fees entitle customers to run Nutanix software such as AHV, Prism, support costs, and AOS (for resilient, performant, secure data stack). Additionally, customers can buy other entitlements for files and network security.

Risks. Licensing costs will vary widely by organization, and the best way to estimate licensing costs is to speak directly with a Nutanix representative. Readers should consider:

- Node purchases could vary depending on the configuration (memory, storage, CPU). Note that hardware costs are a pass-through for Nutanix and go directly to the hardware manufacturer.

- Typically, a node can have 70 to 100 users.

To account for these risks, Forrester adjusted this cost upward by 20%, yielding a three-year, risk-adjusted total PV of $3.6 million.

> Implementation risk is the risk that a proposed investment may deviate from the original or expected requirements, resulting in higher costs than anticipated. The greater the uncertainty, the wider the potential range of outcomes for cost estimates.

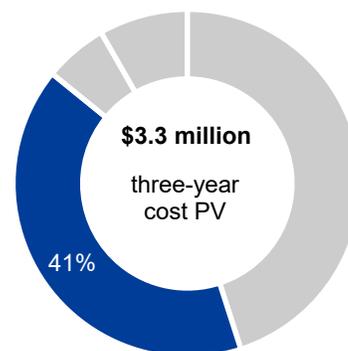| REF.	METRIC	CALCULATION	INITIAL	YEAR 1	YEAR 2	YEAR 3
Nutanix Licensing: Calculation Table						
F1	Node purchases	Composite	$193,700	$193,700	$222,700	$244,100
F2	Nutanix fees	Composite	$591,500	$591,500	$680,100	$745,400
Ft	Nutanix licensing	F1+F2	$785,200	$785,200	$902,800	$989,500
	Risk adjustment	↑20%				
Ftr	Nutanix licensing (risk-adjusted)		$942,240	$942,240	$1,083,360	$1,187,400

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Broker Costs – VMware Or Citrix Procurement

Customers require a desktop virtualization solution to sit on top of the VDI. Nutanix supports both Citrix Virtual Apps And Desktops and VMware Horizon. The best way to determine the cost of a broker is to speak with a representative from the respective technology provider. Broker costs will be paid to the respective vendor.

Modeling and assumptions. Forrester uses the following assumptions for the financial model.

› The composite organization starts with 875 initial users, adding 875, 2,756, and 3,859 in Years 1, 2, and 3, respectively.

› The annual subscription per user is $432.

Risks. Annual subscription costs will vary by provider as well as by organization. Additionally, organizations may already have purchased the services of VMware or Citrix prior to their investment in Nutanix, which would mean that there would be no additional broker cost associated with their Nutanix investment. Readers should determine existing relationships with either of these vendors and the number of anticipated users. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV of $3.3 million.

$3.3 million

three-year cost PV

41%

Broker costs – VMware or Citrix procurement: 41% of total costs

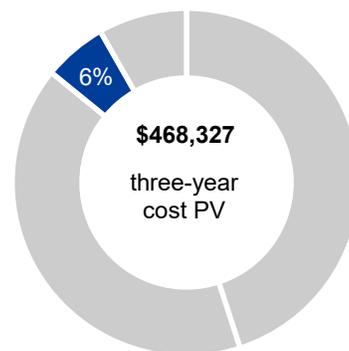| Broker Costs – VMware Or Citrix Procurement: Calculation Table						
REF.	METRIC	CALCULATION	INITIAL	YEAR 1	YEAR 2	YEAR 3
G1	Number of users	A4	875	875	2,756	3,859
G2	Annual subscription	Nutanix	$432	$432	$432	$432
Gt	Broker costs – VMware or Citrix procurement	G1*G2	$378,000	$378,000	$1,190,592	$1,667,088
	Risk adjustment	↑10%				
Gtr	Broker costs – VMware or Citrix procurement (risk-adjusted)		$415,800	$415,800	$1,309,651	$1,833,797

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Implementation And Training

The interviewed organizations shared their unique deployment journeys with Forrester. One organization cited an implementation of three months with a budget of $1M, while another organization completed their VDI deployment in six weeks with the assistance of an architect and a consultant. Training was a key component to accelerating the adoption and success of using the new solution. The executive director shared: "The team that received formalized training was probably eight [employees] — it wasn't more than a weeks' worth of training per person. It was very easy for us to get into this."

› **Modeling and assumptions.** To capture the experiences of the interviewed organizations, Forrester makes the following assumptions for the financial model.

› The composite organization engages with a professional services vendor to assist with the implementation planning and deployment. The engagement costs $50,000.

› Internal implementation labor consists of six resources dedicated over six months.

› The burdened monthly cost of an implementation resource is $10,000.

› A three-day training is provided to eight resources as part of the implementation. A 4-hour training is provided each year to the same eight resources to keep their skills sharp and to update their knowledge on new features and processes.

› The hourly cost of a resource participating in training is $58.

Risks. Implementation costs will vary between organizations, contingent heavily on existing hardware and any existing relationship with Nutanix. Readers should consider the needs of an organization, scale of deployment, and necessary integrations. Organizations that need to purchase hardware components will incur more cost, and organizations that start with a larger deployment may also incur more implementation costs. The best way to estimate implementation-related costs is to speak with a Nutanix representative.

To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV of $468,327.

$468,327
three-year
cost PV

6%

Implementation and training: 6% of total costs

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Implementation And Training: Calculation Table						
REF.	METRIC	CALCULATION	INITIAL	YEAR 1	YEAR 2	YEAR 3
H1	Professional services		$50,000			
H2	Months to deploy		6			
H3	FTEs to deploy		6			
H4	Burdened monthly cost of IT resource	$120,000/12 months	$10,000			
H5	Training hours	Initial: 8 people, 3 days of training Ongoing: 8 people, 4 hours	192	32	32	32
H6	Burdened hourly cost of IT resource (rounded)	$120,000/2,080 hours	$58	$58	$58	$58
Ht	Implementation and training	H1+(H2*H3*H4)+(H5*H6)	$421,136	$1,856	$1,856	$1,856
	Risk adjustment	↑10%				
Htr	Implementation and training (risk-adjusted)		$463,250	$2,042	$2,042	$2,042

Ongoing Administration

Customers cited between two and four administrators with dedicated efforts to managing the environment. The senior solutions manager shared: "It's a combination of four people managing the environment. This is virtualized, but it is still a workstation. So, the support requirement is very similar." The executive director of a life sciences organization told Forrester: "The platform is easy for us to support. We don't have to spend a bunch of time tinkering with it and turning 'nerd knobs,' so to speak, to get the environment to perform. It literally just works."

Modeling and assumptions. To capture the ongoing labor to administer the solution, Forrester makes the following assumptions:

> The composite organization has four VDI administrators that dedicate 50% of their time to the ongoing maintenance and administration of the end user computing environment.

> The burdened annual cost of a VDI administrator is $120,000.

Risks. The number of VDI administrators and the time they dedicate to maintaining the EUC environment will vary by organizations' needs and skill sets. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV of $468,327.

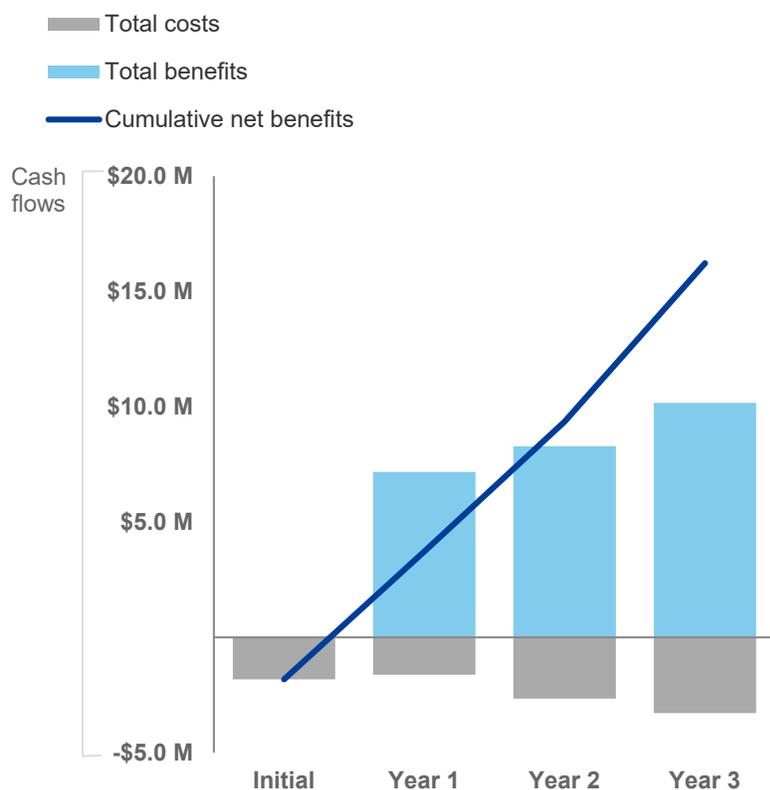**Four administrators** spend 50% of their time on ongoing virtual desktop management.

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Ongoing Administration: Calculation Table

REF.	METRIC	CALCULATION	INITIAL	YEAR 1	YEAR 2	YEAR 3
I1	Number of VDI administrators	Interviews		4	4	4
I2	Percent of time dedicated to Nutanix environment	Interviews		50%	50%	50%
I3	Burdened annual cost of IT resource	Composite		$120,000	$120,000	$120,000
It	Ongoing administration	I1*I2*I3		$240,000	$240,000	$240,000
	Risk adjustment	↑10%				
Itr	Ongoing administration (risk-adjusted)		$0	$264,000	$264,000	$264,000

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Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)

The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

- Total costs
- Total benefits
- Cumulative net benefits

These risk-adjusted ROI, NPV, and payback period values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Total costs	($1,821,290)	($1,624,082)	($2,659,172)	($3,286,640)	($9,391,182)	($7,964,691)
Total benefits	$0	$7,169,688	$8,283,081	$10,166,552	$25,619,320	$21,001,700
Net benefits	($1,821,290)	$5,545,606	$5,623,909	$6,879,912	$16,228,138	$13,037,009
ROI						164%
Payback period						<6 months

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Appendix A: Total Economic Impact

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.

Total Economic Impact Approach

Benefits represent the value delivered to the business by the product. The TEI methodology places 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.

Costs consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.

Flexibility represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

Risks measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.

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 NPV of cash flows.

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.

Return on investment (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.

Discount rate

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.

Payback period

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

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Appendix B: Endnotes

[1] Source: EUC: end user computing; BYOD: bring your own device; CYOD: choose your own device; VDI: virtual desktop infrastructure.

[2] Source: "Five Key Trends That Will Reshape The Employee Technology Experience," Forrester Research, Inc., May 22, 2019.

[3] Source: "The Forrester Tech Tide™: Digital Workspace Tech For Employee App Enablement, Q2 2019," Forrester Research, April 16, 2019.

[4] Source: "Five Key Trends That Will Reshape The Employee Technology Experience," Forrester Research, Inc., May 22, 2019.

[5] Source: "Now Tech: Cloud Desktops, Q4 2019," Forrester Research, Inc., October 10, 2019.

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