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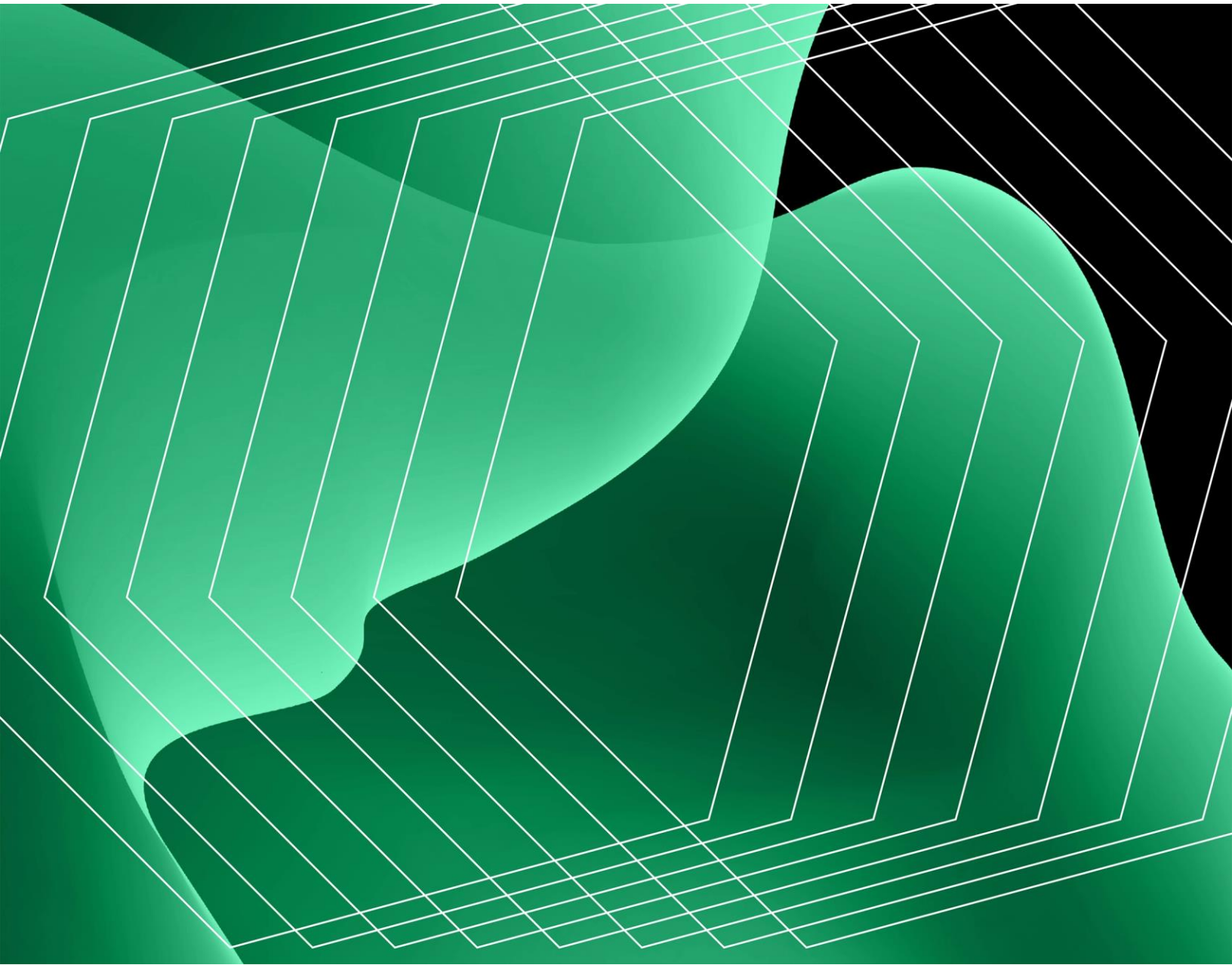
The Total Economic Impact™ Red Hat Enterprise Linux On Microsoft Azure

Cost Savings And Business Benefits Enabled By Red Hat Enterprise Linux On Microsoft Azure

A FORRESTER TOTAL ECONOMIC IMPACT STUDY
COMMISSIONED BY RED HAT AND MICROSOFT, JANUARY 2024



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ABOUT FORRESTER CONSULTING

Forrester provides independent and objective research-based consulting to help leaders deliver key outcomes. Fueled by our customer-obsessed research, Forrester's seasoned consultants partner with leaders to execute their specific priorities using a unique engagement model that ensures lasting impact. For more information, visit forrester.com/consulting.

Executive Summary

Public cloud continues to gather momentum. According to Forrester's Infrastructure Cloud Survey, 82% of enterprise cloud decision-makers are adopting public cloud.[1] Red Hat Enterprise Linux on Microsoft Azure offers a solution that combines the reliability of Red Hat Enterprise Linux with the scalability and flexibility of Microsoft Azure, providing organizations with a cost-effective, secure, and optimized solution for running Red Hat Enterprise Linux workloads in the cloud.

Red Hat Enterprise Linux on Microsoft Azure is enabled by the Azure platform, which offers an optimized environment for running Linux or Red Hat Enterprise Linux workloads on the cloud. Red Hat Enterprise Linux is a commercial enterprise Linux platform and certified for use on Microsoft Azure. With Red Hat and Microsoft, organizations can quickly deploy a more secure, reliable, and flexible hybrid cloud environment that positions organizations for success in fast-changing, competitive markets. Red Hat and Microsoft work in close collaboration to help ensure solutions are optimized for cloud performance.

Red Hat and Microsoft commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying Red Hat Enterprise Linux on Microsoft Azure.[2] The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Red Hat Enterprise Linux on Microsoft Azure on their organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed representatives from six organizations with experience using Red Hat Enterprise Linux on Microsoft Azure. For the purposes of this study, Forrester aggregated the interviewees' experiences and combined the results into a single composite organization that is a $5-billion global organization with 10,000 employees. The composite organization runs Red Hat Enterprise Linux on-premises before initiating its migration journey to Red Hat Enterprise Linux on Microsoft Azure.

KEY STATISTICS

Return on investment (ROI)
192%

Net PV
$7.85M

Payback
<6 months

Benefits PV
$11.94M

Interviewees said that prior to using Red Hat Enterprise Linux on Microsoft Azure, their organizations deployed Red Hat Enterprise Linux on-premises for all their workloads. However, to remain competitive and meet organizational goals, interviewees discussed migration to the cloud to benefit from increased scalability, improved flexibility, cost savings, and improved collaboration, while offloading the burden of managing and maintaining physical infrastructure.

After the investment in Red Hat Enterprise Linux on Microsoft Azure, interviewees noted their organizations ran a hybrid cloud infrastructure that allowed them to leverage benefits of both on-premises infrastructure and cloud services while maintaining control over critical data and applications. Key results from the investment include business continuity savings, a reduction in data center spend, FTE reallocation towards value-adding initiatives, and a reduction in legacy solution costs. Additionally, the investment enabled hybrid scenarios, licensing flexibility, ease of procurement/purchasing, and improved security posture with better manageability/monitoring.

KEY FINDINGS

Quantified benefits. Three-year, risk-adjusted present value (PV) quantified benefits for the composite organization include:

- **Improved business continuity as a result of a 50% reduction in outage frequency and an 85% reduction in outage downtime.** Prior to deploying Red Hat Enterprise Linux on Microsoft Azure, the composite organization experiences 12 outages per year because of hardware failures and natural disasters with each outage lasting an average of 4 hours. The migration to Azure gives the composite organization the continued reliability of Red Hat Enterprise Linux with the addition of necessary tools and infrastructure to maintain business continuity and enhance resiliency in its workloads. Over three years, business continuity savings are worth more than $3.9 million to the composite organization.
- **Reduced data center spend by 80%.** Prior to the investment, the composite organization spends an annual $1.2 million per data center across three data centers. The migration to Red Hat Enterprise Linux on Microsoft Azure enables the composite organization to reduce common costs, including licensing, hardware infrastructure, facility, operational, and maintenance costs. Over three years, data center cost savings are worth more than $4.4 million to the composite organization.
- **Reallocated 40% of FTE time toward value-add business initiatives.** The migration to Red Hat Enterprise Linux on Microsoft Azure increases capacity and productivity for the composite's IT FTEs as it reduces the need for manual infrastructure management by enabling automated updates and patches, simplified backups and disaster recovery, and reduced maintenance and monitoring efforts. Furthermore, integrated support for Red Hat Enterprise Linux on Microsoft Azure between Red Hat and Microsoft ensures a single point of contact for comprehensive support and issue resolution. Over three years, reallocated FTE savings are worth more than $2.7 million to the composite organization.
- **Reduced legacy solution costs by 60%.** As the composite organization shifts workloads from on-premises to Red Hat Enterprise Linux on

Microsoft Azure, the costs related to legacy solutions are reduced as they near end of life. Red Hat Enterprise Linux on Microsoft Azure provides a modern and secure platform with regular updates and patches, ensuring a stable and up-to-date environment. Over three years, legacy solution cost savings are worth $918,000 to the composite organization.

Unquantified benefits. Benefits that provide value for the composite organization but are not quantified for this study include:

- **Enabled hybrid scenarios.** The hybrid cloud environment enables the composite organization to leverage the benefits of both public and private clouds. Through consistent platforms for on-premises and public cloud environments, the composite organization becomes more agile and cost-efficient while maintaining control over sensitive data and meeting regulatory requirements.
- **Improved licensing flexibility.** Licensing flexibility across a pay-as-you-go model, subscription, Azure Reserved Instances, Azure savings plan, and Azure Hybrid Benefit allows the composite organization to optimize costs, scale resources as needed, and easily manage its Red Hat Enterprise Linux licenses in the Azure environment.
- **Increased ease of procurement/purchasing through Azure Marketplace.** The Azure Marketplace simplifies the procurement process for the composite organization as it provides a range of prebuilt solutions and services that can be easily deployed. The composite organization can quickly find and purchase the necessary tools and applications to meet its specific business needs, accelerating time to market and reducing procurement complexities.
- **Improved security posture through better manageability/monitoring.** Azure offers native management and security tools like Azure Monitor, Azure Automation, and Microsoft Defender for Cloud, which enable the composite organization to effectively monitor and manage Red Hat Enterprise Linux workloads. Additionally, Azure provides integration with popular open-source management tools, allowing for seamless automation, configuration management, and orchestration of Red Hat

Enterprise Linux-based environments, enhancing manageability and control.

Costs. Three-year, risk-adjusted PV costs for the composite organization include:

- **Licensing.** Licensing costs scale over the course of three years given the increased usage and migration to Red Hat Enterprise Linux on Microsoft Azure.
- **Internal implementation and training.** These are initial costs associated with activities involved in internal implementation and training, including assessing infrastructure and identifying the internal requirements needed for cloud migration through the evaluation of existing systems, applications, and data.
- **Internal ongoing management.** Ongoing management for Red Hat Enterprise Linux on Microsoft Azure is minimal compared to the composite organization's prior on-premises environment. Activities involved in ongoing management include monitoring performance, optimizing resource allocation, implementing security measures, performing regular patching and updates, establishing backup and disaster recovery strategies, continuous training, and compliance audits.

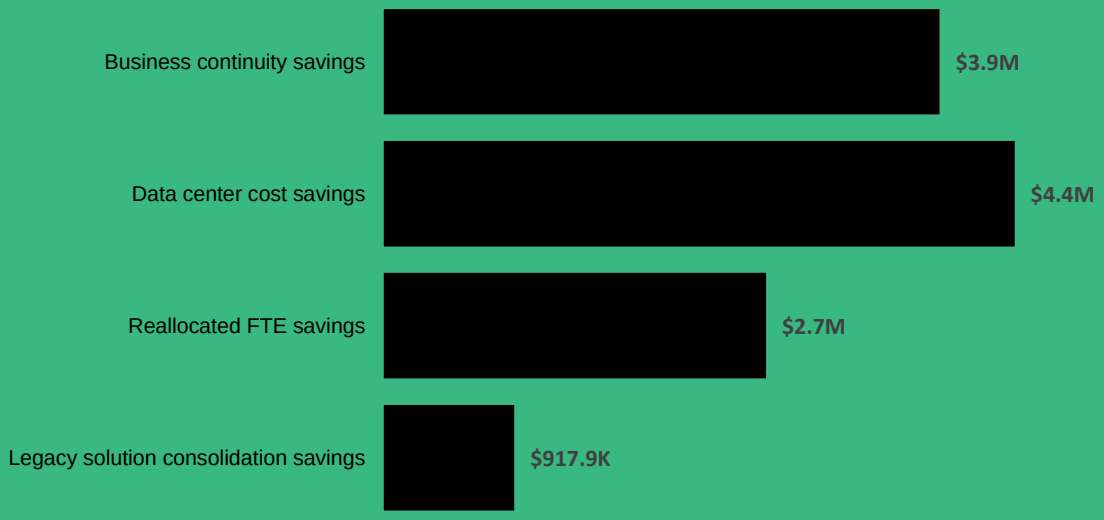
The representative interviews and financial analysis found that a composite organization experiences benefits of $11.94 million over three years versus costs of $4.09 million, adding up to a net present value (NPV) of $7.85 million and an ROI of 192%.

Reduction in outage frequency by Year 3

50%

ROI	BENEFITS PV	NPV	PAYBACK
192%	**$11.94M**	**$7.85M**	**<6 months**

Benefits (Three-Year)



“There are a number of reasons that sold us. First, we have that flexibility to use our Red Hat subscriptions on Azure so we can mix and match, which is huge for us. Second, we have guaranteed compatibility with Microsoft running Red Hat Enterprise Linux on Azure. Third, we have access in the different markets, so our facilities can get access to core systems that are locally deployed.”

GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

TEI Framework And Methodology

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ framework for those organizations considering an investment in Red Hat Enterprise Linux on Microsoft Azure.

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 Red Hat Enterprise Linux on Microsoft Azure can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Red Hat and Microsoft and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the study to determine the appropriateness of an investment in Red Hat Enterprise Linux on Microsoft Azure.

Red Hat and Microsoft 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.

Red Hat and Microsoft provided the customer names for the interviews but did not participate in the interviews.

1. **Due Diligence**
   Interviewed Red Hat and Microsoft stakeholders and Forrester analysts to gather data relative to Red Hat Enterprise Linux on Microsoft Azure.
2. **Interviews**
   Interviewed representatives at six organizations using Red Hat Enterprise Linux on Microsoft Azure to obtain data about costs, benefits, and risks.
3. **Composite Organization**
   Designed a composite organization based on characteristics of the interviewees' organizations.
4. **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 interviewees.
5. **Case Study**
   Employed four fundamental elements of TEI in modeling the investment impact: benefits, costs, flexibility, and risks. Given the increasing sophistication of ROI analyses related to IT investments, Forrester's TEI methodology provides a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

The Red Hat Enterprise Linux On Microsoft Azure Customer Journey

Drivers leading to the Red Hat Enterprise Linux on Microsoft Azure investment

Interviews				
Role	**Industry**	**Region**	**Size**	**Linux-Based Workloads In Azure (%)**
Manager, data center security operations (DCSOps) systems	Software	HQ in United States, global operations	$8.1 billion in annual revenue 20,400 employees	30%
Product owner for operating systems	Energy	HQ in United States	$222.8 billion in annual revenue 44,000 employees	20%
Global director of IT	Wholesale retail	HQ in United States	$1.1 billion in annual revenue 2,600 employees	90%
Lead IT analyst	Energy	HQ in Norway, global operations	$111.8 billion in annual revenue 22,000 employees	N/A
• Head of engineering • Infrastructure architect	Manufacturing	HQ in Switzerland	$16.1 billion in annual revenue 51,300 employees	80%
Director of cloud	Electric distribution and services	HQ in United States, global operations	$22.5 billion in annual revenue 18,000 employees	75%

Key Challenges

Prior to Red Hat Enterprise Linux on Microsoft Azure, interviewees' organizations deployed Red Hat Enterprise Linux on-premises in their data centers given its 10-year life cycle, support, and the ability to run a hybrid cloud model. The enterprise-grade Linux distribution is proven to be a stable, secure, and scalable platform for critical applications. Interviewees discussed the challenges of working entirely from an on-premises environment and the necessity of migrating to the cloud. Interviewees described challenges related to scalability, maintenance and upgrades, resource allocation, security and compliance, skill set availability, and cost considerations. Furthermore, it was difficult for interviewees to scale up or down quickly to adapt to changing workloads.

The interviewees noted how their organizations struggled with common challenges, including:

- **Manually intensive and time-consuming processes.** Interviewees noted that their organizations' on-premises solutions generally took longer to deploy than cloud-based solutions given a variety of factors. Setting up infrastructure, allocating resources, planning and designing, compliance considerations, and the need for skilled personnel impacted the speed the interviewees' organizations could spin up workloads in their on-premises environment. The product owner for operating systems at an energy company described: "Prior to Red Hat Enterprise Linux on Microsoft Azure, business units would request for on-premises servers which would take two weeks to a month to deploy depending on what the requirements were. The entire process was time-consuming as there's all these things that we undergo like reviewing capacity and other planning that is behind it."
- **Inefficient license management resulting in excess license costs.** Interviewees highlighted the higher costs associated with app and workload licenses in their prior on-premises environments. In some cases, a lack of visibility into what licenses were already procured contributed to unnecessary licensing purchases. The global director of IT at a wholesale retail organization noted: "We were paying for more licensing than we needed. What would happen is people would need licenses and they would believe that we didn't have any or they were allocated incorrectly. Then they would go out and procure them and then keep on adding on to that."
- **Reliability and effectiveness of on-premises solutions resulting in downtime.** Interviewees noted that maintaining high reliability and minimizing downtime in data centers was challenging due to various factors. Power outages can disrupt operations, cooling system failures can lead to equipment overheating, and network connectivity issues can impact accessibility. Interviewees particularly highlighted hardware failures and environmental factors that further contributed to the risk of downtime. The director of cloud at an electric distribution and services organization

commented: “There were many pain points attributed to external factors including turning on hardware and outages due to weather and hardware reliability where you always need to keep a spare available. Our prior environment had constant outages.”

- **Limited scalability with on-premises solutions**. The interviewees’ organizations’ data centers needed to anticipate and plan for future growth and capacity requirements. Inadequate scalability or capacity planning led to resource constraints, reduced performance, and difficulties accommodating increased workloads. The lead IT analyst at an energy organization commented, “Those are also a lot of simulations that we simply wouldn’t have room for on-premises which have relatively small data sets.”

Investment Objectives

The interviewees’ organizations searched for a solution that could:

- Enable a hybrid cloud infrastructure while maintaining technical consistency.
- Run critical workloads on a reliable Linux distribution.
- Improve security, reliability, and effectiveness.

> “It gives us a level of comfort in the fact that we’re using an industry-standard-supported software platform.”
>
> GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

> “The benefit in Azure is the ability to scale out to 20,000 CPUs when we need it. We could of course have done that on-premises, but it would have cost us a lot more and it would have taken a lot more time to get it up and running for the user.”
>
> LEAD IT ANALYST, ENERGY

Composite Organization

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

Description of composite and deployment characteristics. The global, multibillion-dollar organization has three data centers running Red Hat Enterprise Linux on-premises. There are a total of 10,000 employees and the IT infrastructure team dedicated to running Red Hat Enterprise Linux on-premises has 15 FTEs. The organization is on a cloud migration journey and invests in Red Hat Enterprise Linux on Microsoft Azure to maintain technical consistency across its Red Hat Enterprise Linux applications and workloads. The composite deploys 50% of Linux-based workloads on Azure.

KEY ASSUMPTIONS

$5 billion in annual revenue

10,000 employees

15 IT infrastructure FTEs

Three data centers

50% Linux-based workloads on Azure

> “We chose Red Hat because we wanted a standard level of support and updates for our production environment. As a primarily Linux shop, we had concerns about using unsupported open-source software and preferred the reliability and predictability of a commercially licensed software like Red Hat.”
>
> GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

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	Business continuity savings	$1,548,000	$1,584,000	$1,584,000	$4,716,000	$3,906,446
Btr	Data center cost savings	$2,592,000	$1,728,000	$864,000	$5,184,000	$4,433,599
Ctr	Reallocated FTE savings	$1,080,000	$1,080,000	$1,080,000	$3,240,000	$2,685,800
Dtr	Legacy solution consolidation savings	$337,500	$371,250	$405,000	$1,113,750	$917,919
	Total benefits (risk-adjusted)	$5,557,500	$4,763,250	$3,933,000	$14,253,750	$11,943,764

Business Continuity Savings

Evidence and data. Interviewees highlighted the impact of Red Hat Enterprise Linux on Microsoft Azure on reducing the number of outages as well as the magnitude of downtime in their present environments. Migration of Red Hat Enterprise Linux to Microsoft Azure ensured seamless workload transition, efficient data recovery, resource scalability, proactive issue detection, and faster deployment and updates for the interviewees' organizations. The solution provided the interviewees' organizations with the necessary tools and infrastructure to maintain business continuity and enhance resiliency in their workloads.

- The product owner for operating systems at an energy company described the impact of improved visibility allowing their organization to address issues more proactively on the Azure cloud and creating a more secure and resilient environment, noting: "Azure has CIS [Center for Information Security] benchmarks and recommends thresholds. With this, I am able to see if we have problematic servers that were spun up and not meeting compliance."

- The director of cloud at an electric distribution and services company highlighted how the migration to Red Hat Enterprise Linux on Microsoft Azure reduced overall downtime, saying: “In our prior environment there was a lot of downtime due to hardware failures or some issues where it required some technician engineers to be dispatched to bring it up those kinds of things. Moving to Red Hat Enterprise Linux on Microsoft Azure completely eliminated that downtime.”
- The global director of IT at a wholesale retail company cited a reduction in the number of outages with Red Hat Enterprise Linux on Microsoft Azure as well as reducing the magnitude of downtime events, commenting: “If we have an outage now, they are not with the same magnitude as what we’ve had before since we are in the public cloud, and you don’t have to physically replace the items. I would say it’s over a 50% decrease in outages with Red Hat Enterprise Linux on Microsoft Azure.”

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- A data center outage impacts 20% of the total 10,000 business users.
- Prior to Red Hat Enterprise Linux on Microsoft Azure, 12 data center outages occurred per year averaging 4 hours of downtime per outage.
- With Red Hat Enterprise Linux on Microsoft Azure, there is a 30% reduction in data center outage frequency in Year 1, 40% reduction in Year 2, and 50% reduction in Year 3.
- With Red Hat Enterprise Linux on Microsoft Azure, the percentage of reduction in average downtime per data center outage in the current environment is reduced by 85%.
- The average fully burdened business end user hourly rate is $40.
- There is a 50% productivity recapture to account for the fact that not all recovered time is spent productively, but may enhance the overall employee experience (e.g., improved work/life balance.)

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The total number of business end users.
- The percentage of business end users impacted by a data center outage.
- The average number of data center outages per year and downtime hours associated per outage.
- The average fully burdened rate of business end users.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $3.9 million.

Reduction of outage frequency by Year 3

50%

"We've been able to build a level of disaster recovery and business continuity that really wasn't possible in an on-premises data center."

GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

Business Continuity Savings					
Ref.	**Metric**	**Source**	**Year 1**	**Year 2**	**Year 3**
A1	Total business end users	Composite	10,000	10,000	10,000
A2	Percentage of business end users a data center outage impacts	Composite	20%	20%	20%
A3	Average number of data center outages that result in downtime in the prior environment (annual)	Composite	12	12	12
A4	Average downtime per data center outage (hours)	Composite	4	4	4
A5	Percentage of reduction in outage frequency with Red Hat Enterprise Linux on Azure	Interviews	30%	40%	50%
A6	Number of avoided downtime hours with Red Hat Enterprise Linux on Azure (annual)	A3*A4*A5	14	19	24
A7	Average fully burdened business end user hourly rate	TEI standard	$40	$40	$40
A8	Subtotal: Avoided outage cost savings	A1*A2*A6*A7	$1,120,000	$1,520,000	$1,920,000
A9	Percentage of reduction in average downtime per data center outage with Red Hat Enterprise Linux on Azure	Interviews	85%	85%	85%
A10	Reduction in outage remediation downtime hours with Red Hat Enterprise Linux on Azure (annual)	((A3*A4)-A6)*A9	29	25	20
A11	Subtotal: Reduction in downtime cost savings	A1*A2*A7*A10	$2,320,000	$2,000,000	$1,600,000
A12	Productivity recapture	Composite	50%	50%	50%
At	Business continuity savings	(A8+A11)*A12	$1,720,000	$1,760,000	$1,760,000
	Risk adjustment	↓10%			
Atr	Business continuity savings (risk-adjusted)		$1,548,000	$1,584,000	$1,584,000
	Three-year total: $4,716,000			**Three-year present value: $3,906,446**	

Data Center Cost Savings

Evidence and data. Interviewees highlighted the impact of moving workloads from on-premises to Red Hat Enterprise Linux on Microsoft Azure on data center costs. The costs in data centers varied depending on various factors, including the size and scale of the organization's data center, location, infrastructure requirements, and the services provided. Some of the common costs that were reduced with Red Hat Enterprise Linux on Microsoft Azure included workload licensing, infrastructure, facility, operational, and maintenance costs.

- Most notably, licenses from Red Hat Enterprise Linux on-premises to Red Hat Enterprise Linux on Microsoft Azure were reduced by at least 50% for a couple of interviewees' organizations. Some interviewees' organizations reallocated their spend to scale through redeploying and purchasing additional licenses. The infrastructure architect at a manufacturing organization commented: "We need additional applications since we are growing for research and development. However, this would have cost more to run applications only for the Red Hat on-premises than on the Azure cloud."
- The director of cloud at an electric distribution and services organization described the impact of bringing existing licenses from Red Hat Enterprise Linux on-premises to Red Hat Enterprise Linux on Microsoft Azure using Azure Hybrid Benefit to reduce their overall data center spend, commenting: "Major cost savings came from cutting down licenses. We were able to cut down license cost in half while utilizing the same number of licenses. Second thing was eliminating warranty and support costs related to hardware."
- The global director of IT at a wholesale retail company highlighted the flexibility of being in the cloud environment as it relates to maintenance, saying: "You're not paying for FTEs to sit in a room and watch that hardware or to be on call to be able to support that hardware. In Azure, you can log on from anywhere and be able to support that."

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- The composite organization has three data centers in Year 1, two data centers in Year 2, and one data center in Year 3 as a result of moving more workloads from the on-premises environment to Red Hat Enterprise Linux on Microsoft Azure.
- Prior to Red Hat Enterprise Linux on Microsoft Azure, the annual spend per data center is $1.2 million per year. This includes infrastructure, facility, operational, maintenance, and compliance costs.
- With Red Hat Enterprise Linux on Microsoft Azure, data center spend is reduced by 80%.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The number of data centers.
- The annual spend per data center.
- The percentage of workloads moved from on-premises to Red Hat Enterprise Linux on Microsoft Azure.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $4.4 million.

Reduction in data center spend

80%

"Red Hat Enterprise Linux on Azure is a pretty easy sell because you're not paying for power, you're not paying for cooling, you're not paying for capital expenditures on the hardware, and you're not paying for the maintenance on that hardware."

INFRASTRUCTURE ARCHITECT, MANUFACTURING

Data Center Cost Savings					
Ref.	**Metric**	**Source**	**Year 1**	**Year 2**	**Year 3**
B1	Number of data centers	Composite	3	2	1
B2	Annual spend per data center	Composite	$1,200,000	$1,200,000	$1,200,000
B3	Percentage of reduction in data center spend	Interviews	80%	80%	80%
Bt	Data center cost savings	B1*B2*B3	$2,880,000	$1,920,000	$960,000
	Risk adjustment	↓10%			
Btr	Data center cost savings (risk-adjusted)		$2,592,000	$1,728,000	$864,000
	Three-year total: $5,184,000			**Three-year present value: $4,433,599**	

Reallocated FTE Savings

Evidence and data. Interviewees discussed the impact that Red Hat Enterprise Linux on Microsoft Azure had on improving overall IT efficiencies, which created additional capacity for IT FTEs. Migration to the cloud reduced the need for manual infrastructure management by enabling automated updates and patches, simplified backups and disaster recovery, and reduced maintenance and monitoring efforts. Furthermore, interviewees noted that integrated support provided by Red Hat and Microsoft ensured seamless collaboration and joint troubleshooting, providing their organizations with a single point of contact for comprehensive support and issue resolution, enhancing the overall support experience and reducing complexities. The impact from these efficiencies enabled IT FTEs at the interviewees' organizations to focus on strategic initiatives and value-added tasks, ultimately saving time and increasing productivity.

- The global director of IT at a wholesale retail organization described how they used their time savings towards upskilling and reallocating staff, commenting: "We are in the process of enabling our staff and investing time with the labor that we saved to refactor applications. By refactoring them and not replacing them, we save on training or procuring new software, so we're gaining additional value through that process."

- The head of engineering at a manufacturing organization highlighted an easier upgrade and patch management within the Azure cloud, saying: “It’s easier to manage the operating system in the cloud because we use only on-demand VMs [virtual machines]. Everything that is security patch, upgrade, and so on becomes a lot simpler in the sense that we just need to update the OS [operating systems] image in Azure and we are done with the upgrade.”
- The manager of DCSOps systems at a software organization highlighted the impact of integrated support on the team, commenting: “Since we have proper updates being released and the service is also secured with the vulnerabilities and everything. We also have support from the Red Hat team whenever there is a need.”
- The product owner for operating systems at an energy organization cited a 60% reduction in design FTEs as a result of moving from on-premises to Red Hat Enterprise Linux on Microsoft Azure.

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- The IT infrastructure team dedicated to running Red Hat Enterprise Linux on-premises consists of 15 FTEs.
- Forty percent of infrastructure engineers are reallocated towards other value-add activities.
- The average infrastructure engineer fully burdened annual salary is $200,000.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The number of IT infrastructure engineers.
- The average infrastructure engineer fully burdened annual salary.

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

Percent of reallocated infrastructure engineers

40%

"We estimate that our engineers have 30% more time to be able to focus on new initiatives for the business."

GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

Reallocated FTE Savings					
Ref.	**Metric**	**Source**	**Year 1**	**Year 2**	**Year 3**
C1	Number of infrastructure engineers in prior environment	Composite	15	15	15
C2	Percentage of infrastructure engineers reallocated to other value-add activities	Interviews	40%	40%	40%
C3	Average infrastructure engineer fully burdened annual salary	TEI standard	$200,000	$200,000	$200,000
Ct	Reallocated FTE savings	C1*C2*C3	$1,200,000	$1,200,000	$1,200,000
	Risk adjustment	↓10%			
Ctr	Reallocated FTE savings (risk-adjusted)		$1,080,000	$1,080,000	$1,080,000
	Three-year total: $3,240,000		**Three-year present value: $2,685,800**		

Legacy Solution Consolidation Savings

Evidence and data. Some interviewees noted the reduction in legacy solutions after migrating to Red Hat Enterprise Linux on Microsoft Azure. By moving away from outdated and unsupported systems, the interviewees' organizations eliminated the risks associated with security vulnerabilities, performance limitations, and compliance issues. Interviewees noted that Red Hat Enterprise Linux on Microsoft Azure provided a modern and secure platform with regular updates and patches, ensuring a stable and up-to-date environment. The flexibility and scalability of Azure enabled interviewees' organizations to seamlessly transition their legacy solutions to the cloud, leveraging the power of Red Hat Enterprise Linux and Azure's infrastructure.

The global director of IT at a wholesale retail organization shared the cost savings experienced by their organization as it related to sunsetting legacy solutions in their environment as a result of the move to Red Hat Enterprise Linux on Azure, saying: "Legacy contracts tend to be at least 40% to 50% discounted compared to what the OEM [original equipment manager] would charge. There's no incurred maintenance cost from a software perspective because it's not supported anymore."

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- The composite spends $750,000 in legacy solution costs.
- With Red Hat Enterprise Linux on Microsoft Azure, 50% of legacy solutions are retired in Year 1, 55% are retired in Year 2, 60% are retired in Year 3.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the cost of legacy solutions.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $918,000.

Percentage of legacy solutions retired with Red Hat Enterprise Linux on Microsoft Azure

60%

Legacy Solution Consolidation Savings					
Ref.	**Metric**	**Source**	**Year 1**	**Year 2**	**Year 3**
D1	Legacy solution costs	Composite	$750,000	$750,000	$750,000
D2	Percentage of legacy solutions retired with Red Hat Enterprise Linux on Microsoft Azure	Interviews	50%	55%	60%
Dt	Legacy solution consolidation savings	D1*D2	$375,000	$412,500	$450,000
	Risk adjustment	↓10%			
Dtr	Legacy solution consolidation savings (risk-adjusted)		$337,500	$371,250	$405,000
	Three-year total: $1,113,750			**Three-year present value: $917,919**	

Unquantified Benefits

Interviewees mentioned the following additional benefits that their organizations experienced but were not able to quantify:

- **Enabled hybrid scenarios.** Interviewees highlighted the benefit of running a hybrid cloud environment to leverage the benefits of both public and private clouds. By seamlessly integrating on-premises infrastructure with public cloud services, interviewees' organizations became more agile and cost-efficient while maintaining control over sensitive data and meeting regulatory requirements. The lead IT analyst at an energy organization commented: "We needed an environment that supported our applications because a lot of our applications are commercial that we cannot modify. We had to lift and shift them into a cloud environment as is with little or no change in many cases."

- **Improved licensing flexibility.** Interviewees highlighted the benefit Red Hat Enterprise Linux on Microsoft Azure's licensing flexibility through a variety of options to meet the unique needs of each business. The interviewees' organizations could bring their existing Red Hat Enterprise Linux subscriptions to Azure or take advantage of the pay-as-you-go model for Red Hat Enterprise Linux virtual machines. Additionally, Reserved Instances on Red Hat Enterprise Linux on Microsoft Azure allowed interviewees' organizations to save costs by committing to a one- or three-year term, offering significant discounts for predictable and sustained Red Hat Enterprise Linux workload usage in the cloud. This flexibility allowed the interviewees' organizations to optimize costs, scale resources as needed, and easily manage their Red Hat Enterprise Linux licenses in the Azure environment.
  The global director of IT at a wholesale retail organization commented on the range of licensing they used based on what was most cost-effective for the apps, saying: "A lot of what we do is based on Reserved Instances. These applications are our core business, so they're not getting shut down. In certain instances, for development, we use spot instances. I think most apps are on a subscription basis."
- **Increased ease of procurement/purchasing through Azure Marketplace.** Interviewees noted a simplified procurement process through Azure Marketplace which provided a wide range of prebuilt solutions and services that could be easily deployed. The interviewees highlighted that their organizations could quickly find and purchase the necessary tools and applications to meet their specific business needs, accelerating time to market and reducing procurement complexities. The director of cloud at an electric and services organization commented: "You can enable your Marketplace, which offers easy to build subscriptions. You can start immediately without worrying about lawsuits of license violations costs, and in the long term, you can look into different options available on Azure and Red Hat Enterprise Linux."
- **Improved security posture through better manageability/monitoring.** Interviewees attributed an improvement in security posture as a result of various features and integrations within Azure. They noted Azure offers

native security management tools like Azure Monitor, Azure Automation, and Microsoft Defender for Cloud, which enabled their organizations to effectively monitor and manage Red Hat Enterprise Linux workloads. Additionally, Azure provided integration with popular open-source management tools, allowing for seamless automation, configuration management, and orchestration of Red Hat Enterprise Linux-based environments, enhancing manageability and control.

The global director of IT at a wholesale retail organization commented: "From firewalls to intrusion protection, there's a lot more advanced tools that are in Azure, whether I can use Azure-native tools or, in a lot of cases, where I purchase third party. We can certainly improve the security posture a lot easier running on software-defined networking than we could ever with just like a box that's deployed somewhere."

> "With Azure Marketplace, the actual time to market is much faster because you're not trying to come up with solutions. The solutions are already there for you. You just use the native tools to be able to migrate and build out and those are tools that we are already familiar with."
>
> GLOBAL DIRECTOR OF IT, WHOLESALE RETAIL

> “Azure provides all the tools to make your life easier. Microsoft goes out of their way to provide all the security tools and dashboards so you can see what your servers are. We use Defender for Linux, Automanage, and Azure Update Management, which is the patching mechanism that we use.”
>
> PRODUCT OWNER FOR OPERATING SYSTEMS, ENERGY

Flexibility

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might implement Red Hat Enterprise Linux on Microsoft Azure and later realize additional uses and business opportunities, including:

- **Reduced audit costs.** Some interviewees described the impact that Red Hat Enterprise Linux on Microsoft Azure had on reducing audit costs. They noted that features and capabilities in the solution helped their organizations demonstrate compliance with regulatory requirements, facilitating the audit process and potentially reducing associated costs. The global director of IT at a wholesale retail organization commented: “The amount of audit trails that we have to show or the number of systems that we have to monitor is significantly less than it was before. With that being said, auditors, which are very expensive, don’t spend as many hours sitting in the conference room.”
- **Avoided consulting costs.** Interviewees also highlighted the impact and ease from migrating Red Hat Enterprise Linux on-premises workloads to

Red Hat Enterprise Linux on Microsoft Azure rather than adopting a different solution entirely. Given the expertise of internal IT FTEs on Red Hat Enterprise Linux workloads, migrating to another solution would have required additional training and/or third-party consultancies to assist in the migration. The global director of IT at a wholesale retail organization commented, “We estimated that if we went with [a certain point solution], we would have spent $700,000 in labor costs for consulting just because we did not have the knowledge to refactor applications on our own and it would take time to ramp up to get to a level.”

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

> “We chose Red Hat because it has been a trusted and reliable operating system within our organization for many years. Our other vendors have close ties with Red Hat and provide solutions that are compatible with it. We value the support and expertise that Red Hat offers."
>
> PRODUCT OWNER FOR OPERATING SYSTEMS, ENERGY

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**
Etr	Licensing	$0	$1,050,000	$1,260,000	$1,512,000	$3,822,000	$3,131,856
Ftr	Internal implementation and training	$825,000	$0	$0	$0	$825,000	$825,000
Gtr	Internal ongoing management	$0	$55,000	$55,000	$55,000	$165,000	$136,777
	Total costs (risk-adjusted)	$825,000	$1,105,000	$1,315,000	$1,567,000	$4,812,000	$4,093,633

Licensing

Evidence and data. Interviewees noted that Red Hat Enterprise Linux on Microsoft Azure offered a variety of flexible licensing options. Their organizations could bring their existing Red Hat Enterprise Linux subscriptions to Azure and receive support and updates directly from Red Hat. Alternatively, Azure provided the pay-as-you-go model, allowing the interviewees' organizations to pay for Red Hat Enterprise Linux virtual machines on an hourly basis. This flexibility enabled the interviewees' organizations to optimize costs based on their usage patterns and scale resources as needed. Additionally, Azure Hybrid Benefit for Linux allowed the interviewees' organizations with active Red Hat Enterprise Linux subscriptions to save on Azure VM usage by applying their existing licenses.

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- Licensing costs scale over the course of three years as usage increases. Licensing costs are $1 million in Year 1, $1.2 million in Year 2, and $1.4 million in Year 3.
- Pricing may vary. Contact Microsoft and Red Hat for additional details.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The hourly usage of virtual machines.
- The savings options utilized (i.e., pay-as-you-go, savings plan, Reserved Instances, Azure Hybrid Benefit.)

Results. To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $3.1 million.

Licensing						
Ref.	**Metric**	**Source**	**Initial**	**Year 1**	**Year 2**	**Year 3**
E1	Licensing	Composite		$1,000,000	$1,200,000	$1,440,000
Et	Licensing	E1		$1,000,000	$1,200,000	$1,440,000
	Risk adjustment	↑5%				
Etr	Licensing (risk-adjusted)		$0	$1,050,000	$1,260,000	$1,512,000
	Three-year total: $3,822,000			**Three-year present value: $3,131,856**		

Internal Implementation And Training

Evidence and data. Interviewees discussed internal implementation and training needed for their organizations' migration to Red Hat Enterprise Linux on Microsoft Azure including assessments on infrastructure and identifying the requirements needed for cloud migration. This included evaluating the existing systems, applications, and data that would be migrated into Azure. Furthermore, training was subjective for employees as learning curves varied. For interviewees' organizations who were new to Azure, interviewees cited several days of initial training with the expectation that FTEs would be fully versed in Azure within six months.

The director of cloud at an electric distribution and services organization commented: "We had a dedicated cloud team to support these migration activities. These people were more involved on day-to-day once we moved into execution mode."

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- Six months are needed for initial implementation and training.
- There are 15 cloud engineers involved in implementation and training.
- These engineers dedicate 50% of their time dedicated to implementation and deployment.
- Average cloud engineer FTE fully burdened monthly salary is $16,667.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The number of FTEs involved in implementation and deployment.
- The percentage of FTE time dedicated towards implementation and deployment.
- The average FTE fully burdened monthly salary.

Results. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $825,000.

Internal Implementation And Training						
Ref.	**Metric**	**Source**	**Initial**	**Year 1**	**Year 2**	**Year 3**
F1	Months needed for initial implementation and training	Interviews	6			
F2	Number of cloud engineers involved in implementation and deployment	Composite	15			
F3	Percentage of time dedicated to implementation and training	Composite	50%			
F4	Average cloud engineer FTE fully burdened monthly salary	TEI standard	$16,667			
Ft	Internal implementation and training	F1*F2*F3*F4	$750,000	$0	$0	$0
	Risk adjustment	↑10%				
Ftr	Internal implementation and training (risk-adjusted)		$825,000	$0	$0	$0
Three-year total: $825,000			**Three-year present value: $825,000**			

Internal Ongoing Management

Evidence and data. Interviewees described ongoing management for Red Hat Enterprise Linux on Microsoft Azure involving monitoring performance, optimizing resource allocation, implementing security measures, performing regular patching and updates, establishing backup and disaster recovery strategies, continuous training, and compliance audits. Effective management ensured optimal performance, data protection, and the long-term success of Red Hat Enterprise Linux workloads on Azure.

The product owner for operating systems at an energy organization commented on the minimal ongoing management effort needed in their organization's environment, saying: "Once you learn Red Hat Enterprise Linux on Microsoft Azure, you know how to do it. And then if you automate it, all you need to do is press the easy button and then everything appears magically."

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- There are five cloud engineers involved in ongoing management.
- These engineers dedicate 5% of their time to ongoing management of Red Hat Enterprise Linux on Microsoft Azure.
- The average cloud engineer fully burdened annual salary is $200,000.

Risks. Forrester recognizes that these results may not be representative of all experiences and that results will vary depending on the following factors:

- The number of FTEs involved in ongoing management.
- The percentage of time dedicated to ongoing management depends on the complexity of the environment.
- The average FTE fully burdened annual salary.

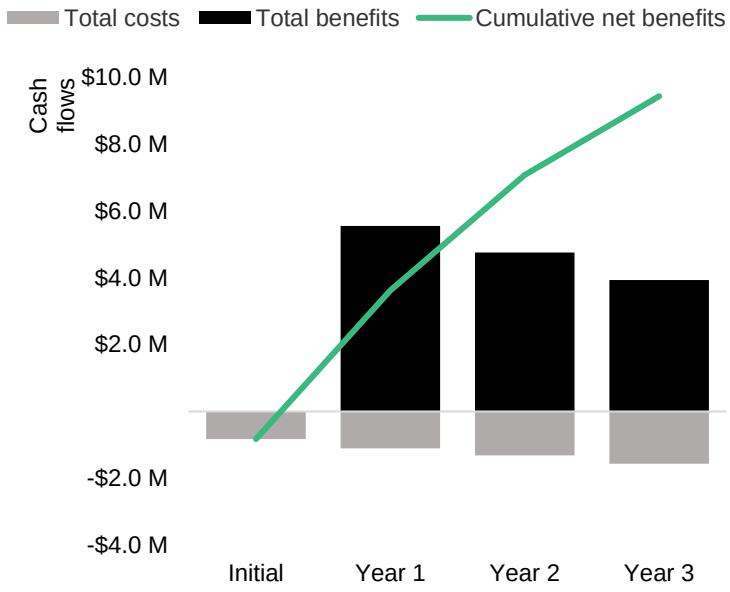
Results. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of $137,000.

Internal Ongoing Management						
Ref.	**Metric**	**Source**	**Initial**	**Year 1**	**Year 2**	**Year 3**
G1	Number of cloud engineers involved in ongoing management	Composite		5	5	5
G2	Percentage of time dedicated to ongoing management of Red Hat Enterprise Linux on Microsoft Azure	Composite		5%	5%	5%
G3	Average cloud engineer fully burdened annual salary	TEI standard		$200,000	$200,000	$200,000
Gt	Internal ongoing management	G1*G2*G3		$50,000	$50,000	$50,000
	Risk adjustment	↑10%				
Gtr	Internal ongoing management (risk-adjusted)		$0	$55,000	$55,000	$55,000
	Three-year total: $165,000			**Three-year present value: $136,777**		

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.

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 Analysis (Risk-Adjusted Estimates)

	Initial	Year 1	Year 2	Year 3	Total	Present Value
Total costs	($825,000)	($1,105,000)	($1,315,000)	($1,567,000)	($4,812,000)	($4,093,633)
Total benefits	$0	$5,557,500	$4,763,250	$3,933,000	$14,253,750	$11,943,764
Net benefits	($825,000)	$4,452,500	$3,448,250	$2,366,000	$9,441,750	$7,850,131
ROI						192%
Payback period (months)						<6

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."

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.

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.

Appendix B: Endnotes

[1] Source: "Public Cloud Market Insights, 2023," Forrester Research, Inc., November 27, 2023.

[2] 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.

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