

FORRESTER®

The Total Economic Impact™ Of Amazon Elastic File System

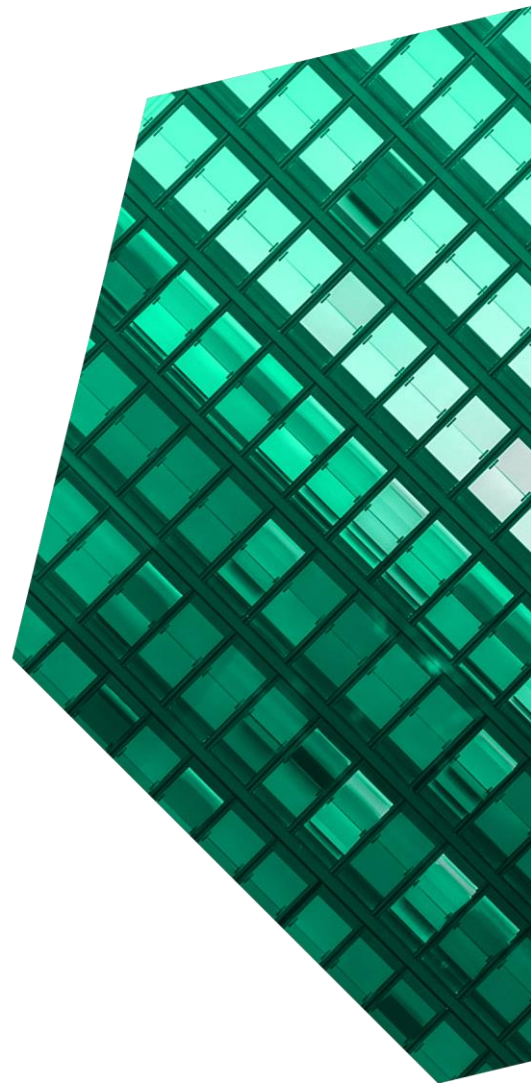
Cost Savings And Business Benefits
Enabled By Amazon Elastic File System

SEPTEMBER 2021

Table Of Contents

Consulting Team: *Line Larrivaud, Consultant*
Dylan McKendry, Consultant

Executive Summary	1
The Amazon Elastic File System Customer Journey	6
Key Challenges	6
Composite Organization.....	6
Analysis Of Benefits	8
Increased Employee Productivity	8
Incremental Revenue From Faster Time-To-Market	10
Cost Savings From Retiring Previous Solutions And Improving Storage Utilization	13
Cost Savings From Improved Data Traceability And Retention.....	14
Unquantified Benefits	16
Flexibility.....	16
Analysis Of Costs	17
Amazon EFS Storage Fees.....	17
Planning, Implementation, And Data Migration Costs	19
Financial Summary	22
Appendix A: Total Economic Impact	23



ABOUT FORRESTER CONSULTING

Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. For more information, visit forrester.com/consulting.

© Forrester Research, Inc. All rights reserved. Unauthorized reproduction is strictly prohibited. Information is based on the best available resources. Opinions reflect judgment at the time and are subject to change. Forrester®, Technographics®, Forrester Wave, RoleView, TechRadar, and Total Economic Impact are trademarks of Forrester Research, Inc. All other trademarks are the property of their respective companies.

Executive Summary

Forrester's analysis of current Amazon Web Services customers found that Amazon Elastic File System improved employee productivity, accelerated time-to-market, reduced total cost of ownership, and improved data management while providing reliability and flexibility at scale. Ultimately, a composite organization modeled after the interviewed organizations with 200 TB of file storage would achieve a 219% ROI over three years by replacing its previous solution with the Amazon Elastic File System.

Organizations need to store and manage massive amounts of file data that continues to grow exponentially. Their file storage infrastructures are becoming more complex to scale and require an increasing amount of time to maintain and monitor. To reduce their storage costs and the time spent managing infrastructures, driving rapid innovation, and improving data access to business users, enterprises are looking at flexible file storage solutions that offer consumption-based pricing. They also demand dependability and agility at scale, which is foundational to future-fit technology strategies.

Amazon Web Services (AWS) commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying [Amazon Elastic File System \(Amazon EFS\)](#). The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Amazon EFS on their organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed four current Amazon EFS customers. For the purposes of this study, Forrester aggregated the experiences of the interviewed customers and combined the results into a single [composite organization](#).

Prior to using Amazon EFS, the customers used multiple file storage solutions, including on-premises infrastructures and self-managed, and cloud-based open source systems. However, these previous

KEY STATISTICS



Return on investment (ROI)
219%



Payback period
<6 months

environments yielded limited success and left customers with siloed management, complex capacity planning, issues with procurement and optimization, and inefficient storage allocation. These limitations led to fixed file-storage capacities, increased costs, created innovation bottlenecks, and frustrated business users.

After the investment in Amazon EFS, the customers were able to centralize and scale their file storage elastically and generate benefits that spanned throughout the organizations. Key results from adopting Amazon EFS include increased employee productivity, reduced total cost of ownership (TCO), faster time-to-market, simplified data management, and better retention policies.

KEY FINDINGS

Quantified benefits. The following risk-adjusted present value (PV) quantified benefits are representative of those experienced by the companies interviewed and applied to a composite organization with 200 TB of file storage in Year 1.

These benefits span the entire organization from the storage, DevOps, and applications development teams to end users. They include:

- **Improved employee productivity of \$707,000.** Amazon EFS reduced the time IT storage administrators spent on storage provisioning and maintenance tasks by 90%. By centralizing file data, Amazon EFS also reduced the time business users need to locate and access data by 25%. This enhancement in productivity generates \$707,000 in savings for the composite organization over three years.
- **Incremental revenue of \$337,000 from accelerated application development and faster time-to-market.** By enabling organizations to dynamically scale their file storage up or down, Amazon EFS eliminated the procurement activities needed to increase file storage capacities. As a result, the organizations reduced the average lead time required to set up storage environments by 98%. It also accelerated application development by decreasing the time application developers spent on repetitive tasks (e.g., applications configuration, compatibility, data persistence) by 10%. This faster time-to-market results in \$337,000 of incremental revenue over three years for the composite organization.
- **Cost savings of \$2.2 million from retiring previous solutions and improving storage utilization.** Interviewed organizations replaced their previous file storage solutions with Amazon EFS, which improved their file storage capacity utilization by an average of 43% in Year 1. These improvements yield \$2.2 million in capital and operating expense savings to the composite organization over three years.
- **Cost savings of \$501,000 from improved data traceability and retention.** By implementing Amazon EFS, interviewed customers were able to extend their data retention policies and

improve data traceability. For the composite organization, improving data management reduces the volume of lost, misplaced, or deleted data by 90%, totaling \$501,000 in savings over three years.

Unquantified benefits. Interviewees said their organizations experienced other benefits that they could not yet quantify. These include: improving file storage performance; increasing infrastructure resiliency; improving customer experience (CX) by reducing downtime, outages, and customer-facing incidents; enhancing employee experience (EX) and engagement by eliminating repetitive and burdensome tasks; and strengthening data privacy, archiving, and security.

Flexibility. Amazon EFS customers gained future opportunities to deploy and integrate additional AWS services, and to support distributed workforces and business models. Amazon EFS also ensured business continuity during the COVID-19 pandemic by accommodating significant spikes in data consumption, ensuring reliability, and adapting to new organizational needs with speed.

“Our data was siloed and needed to be mined and interpreted. Now, it is available to thousands of scientists while being stored in a central, secure place. It is a paradigm shift.”

– Director of informatics and data science, pharmaceuticals company, US

Costs. Risk-adjusted PV costs include:

- **Storage fees of \$674,000.** The composite organization uses 200 TB of data in Year 1, and the total service fees are nearly \$674,000 over three years.

- **Planning, implementation, and data migration costs of \$502,000.** The composite organization's total costs for planning and deployment are \$502,000. This includes the vendor selection process, internal project management, and training.

The customer interviews and financial analysis found that a composite organization experiences benefits of \$3.7 million over three years versus costs of \$1.2 million, adding up to a net present value (NPV) of \$2.6 million and an ROI of 219%.

“Whenever we needed to increase the level of storage capacity, it required a significant amount of effort. Amazon EFS [allowed us not] to worry about extending or expanding the capacity.”

– *Cloud engineer, Bayer*

“ Amazon EFS fast-tracked our procure, stack, and rack process from weeks to minutes.”

— *Ravi Devesetti, EVP, Global CTO of Consumer Information Services, Experian, USA*



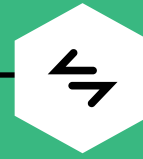
ROI
219%



BENEFITS PV
\$3.7 million

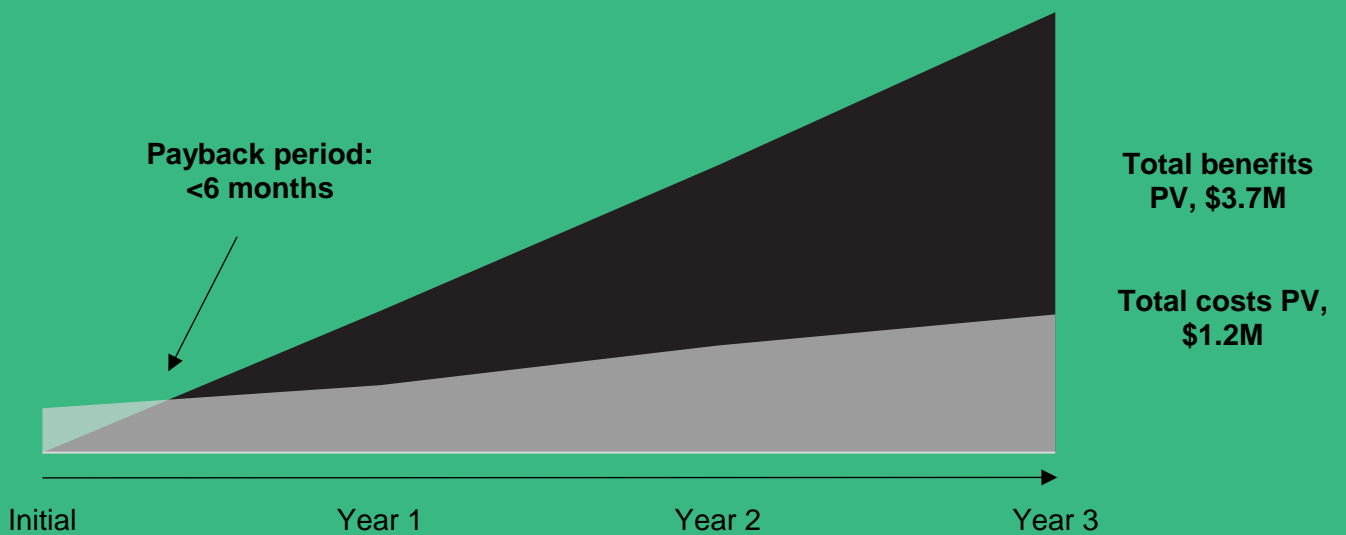


NPV
\$2.6 million

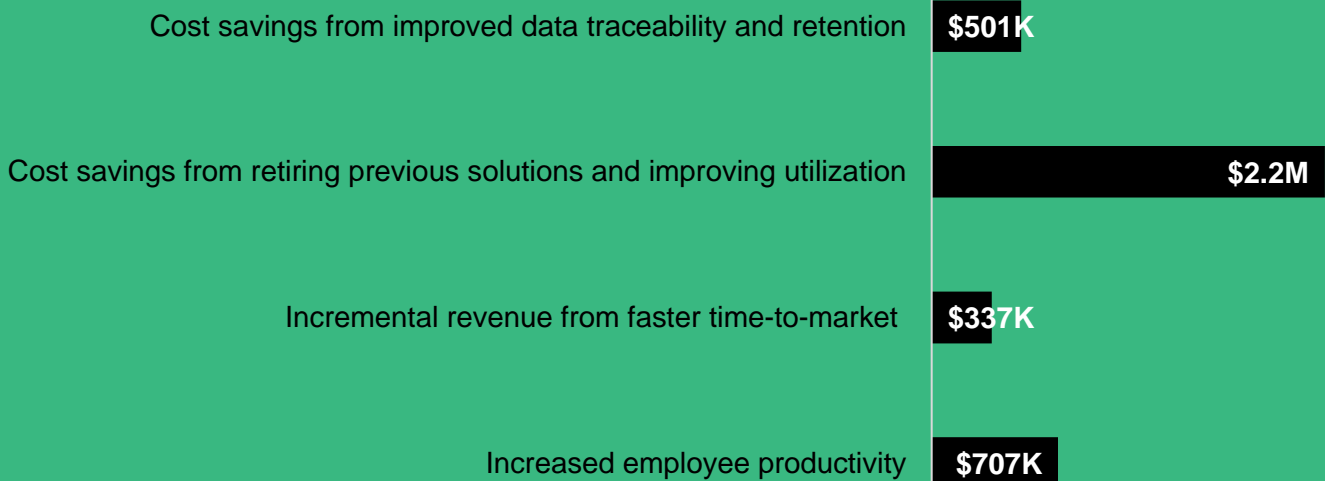


PAYBACK
<6 months

Financial Summary



Benefits (Three-Year)



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 Amazon EFS.

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 Amazon EFS can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by AWS 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 Amazon EFS.

AWS 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.

AWS provided the customer names for the interviews but did not participate in the interviews.



DUE DILIGENCE

Interviewed AWS stakeholders and Forrester analysts to gather data relative to Amazon EFS.



CUSTOMER INTERVIEWS

Interviewed four decision-makers at organizations using Amazon EFS 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 representative financial model 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 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 Amazon Elastic File System Customer Journey

■ Drivers leading to the Amazon EFS investment

Interviewed Organizations			
Company	Industry	Region	Interviewee
Federated Wireless	Telecommunications	Headquartered in the United States	Senior director of engineering
Bayer	Crop science, pharmaceuticals, and consumer health	Headquartered in Germany	Cloud engineer
Experian	Financial services	Headquartered in Ireland	Chief technology officer
Anonymous	Pharmaceuticals	Headquartered in the United States	Director of informatics and data science

KEY CHALLENGES

Prior to using Amazon EFS, the interviewed customers used multiple file storage solutions, including on-premises infrastructures, cloud open-source systems, and self-managed cloud solutions. Interviewees reported many challenges in these previous environments, including:

- **Limited scalability.** Interviewed organizations had to go through slow and burdensome processes to scale their storage capacities in their previous environments. Decision-makers were looking for a solution that would allow their organizations to elastically scale storage up or down to better manage spiky and unpredictable workloads and to improve customers' digital experiences. For instance, operating a citizens broadband radio service (CBRS) wireless network requires daily jobs to calculate "path loss" for registered devices. Federated Wireless sought a solution that could scale these jobs to keep pace with the rapid growth of its CBRS wireless network.
- **Inability to keep up with customers' needs and expectations.** Interviewees said storage capability is a foundational element that enables data-based products and services. However, their previous file storage solutions negatively

impacted their ability to serve their customers.

For instance, Experian customers were asking for faster analytics, and the organization was unable to deliver that with its previous environment.

These challenges pushed decision-makers to look for new file storage solutions that would allow for the deployment of Experian's platform in less time.

- **Poor employee experience.** Interviewees said their previous distributed file storage environments and a lack of cohesive storage strategies negatively impacted employees' productivity. For instance, maintaining and provisioning existing solutions was an error-prone and time-consuming process for storage administrators, applications developers had storage capabilities front of mind, and business users faced inefficiencies and lost time accessing scattered data. They also raised concerns about the ability of existing infrastructures to enable the storage of data that was unpredictably large. These concerns took employees away from value-added activities and slowed innovation throughout the organizations.

COMPOSITE ORGANIZATION

Based on the Amazon EFS customer 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 four companies that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization has the following characteristics:

Description of composite. The organization is a research and life sciences company based in North America that offers a portfolio of data-based products and services. The organization has global operations and a total of 4,000 employees. The company earns \$1 billion annually with an 8% operating margin.

Deployment characteristics. The composite organization needed to consolidate its file data storage to a cloud-based platform to enable shared access internally. The company also needed to enhance its storage capabilities for file data used externally in client products, applications, and services across three availability zones (AZs).

For that, the organization looked for a cloud-based storage solution with consumption-based pricing that could support multiple file data uses cases including but not limited to:

- Genome processing, molecular modeling, and pharmaceutical design.
- Rendering, computer-aided graphics, and image analysis.
- Financial simulation and risk analysis.
- Inventory analysis, logistics, consumer profiling, and revenue prediction.

The composite organization has a storage capacity in Amazon EFS of 200TB in Year 1, growing by 20% year-over-year. The company selected Amazon EFS to replace its previous file storage solutions, a cloud open-source system and on-premises solutions, made of disparate servers and hard drives across multiple locations. The organization plans, implements, and deploys Amazon EFS over five

months and then continues to gradually migrate data from the previous solutions to Amazon EFS.

Key assumptions

- **\$1 billion annual revenue**
- **8% operating margin**
- **4,000 employees**
- **200TB file data**

“By default, Amazon EFS is highly available across all Availability Zones. We do not have to spend the additional time or effort to build a high-availability capability. It’s just natively available.”

– Ravi Devesetti, EVP, Global CTO of Consumer Information Services, Experian, US

Analysis Of Benefits

■ Quantified benefit data as applied to the composite organization

Total Benefits						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
Atr	Increased employee productivity	\$177,102	\$274,447	\$425,428	\$876,977	\$707,448
Btr	Incremental revenue from faster time-to-market	\$131,859	\$135,815	\$139,889	\$407,564	\$337,217
Ctr	Cost savings from retiring previous solutions and improving storage utilization	\$814,302	\$888,311	\$965,671	\$2,668,284	\$2,199,939
Dtr	Cost savings from improved data traceability and retention	\$201,609	\$201,609	\$201,609	\$604,827	\$501,372
	Total benefits (risk-adjusted)	\$1,324,872	\$1,500,182	\$1,732,597	\$4,557,651	\$3,745,976

INCREASED EMPLOYEE PRODUCTIVITY

Evidence and data. The automated provisioning and dynamic scaling offered by Amazon EFS increased the productivity of individuals responsible for managing storage and business users. It reduced their administrative burden by leveraging self-service functionalities and enabling on-demand storage. Reducing the complexity of managing file servers yielded various productivity benefits for the interviewed customers. Interviewees said:

- The self-service functionalities and set-and-forget services embedded in Amazon EFS removed the burden of provisioning and managing numerous file data storage volumes. Being fully managed, Amazon EFS reduced the time spent by individuals responsible for managing storage on file storage administration, provisioning, and maintenance by 90%. This freed up their time to focus on new projects or storage initiatives.
- The simplified provisioning process with Amazon EFS had a significant impact on the productivity of procurement teams. Interviewees said that, in some cases, it completely eliminated their organization's file storage provisions activities.

- By centralizing file data, Amazon EFS reduced the time business users needed to locate and access data by 25% and increased collaboration. Business users also become confident in the ability of the storage capabilities to manage unpredictable workloads, allowing them to focus on insights rather than technology.
- DevOps and applications development teams also observed time savings. These are described in the [next section of this study](#).

Modeling and assumptions. Forrester assumes the following about the composite organization:

- In the previous environment, between three and five storage administrators spent an average of 20% of their time working on file storage administration, provisioning, and maintenance activities.
- The annual compensation for an individual who manages storage is \$101,250, and this rises with inflation over time.
- In the previous environment, three other FTEs (e.g., IT procurement team members, IT central team members, system admins) spent on

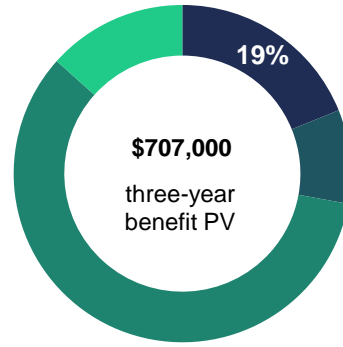
average 2% of their time working on procurement activities for increasing file storage capacity.

- The annual compensation for an individual who manages procurement activities associated with file data storage is \$81,000, and this rises with inflation over time.
- An average of 343 business users access file data stored in Amazon EFS.
- In the previous environment, business users spent an average of 3% of their time looking for data from disparate storage systems.
- The annual compensation for a business user is \$125,450, and this rises with inflation over time.
- The productivity conversion rate is 50%. This means FTEs convert 50% of their freed-up hours to new projects that add value to the organization.

Risks. The impact of increased employee productivity will vary with:

- The number of FTEs dedicated to managing, provisioning, and procuring for storage, and the amount of time they spend on these activities.
- The number of business users accessing data and how frequently they do so.
- The processes in place to provision storage prior to Amazon EFS implementation.
- The fully loaded compensation of FTEs.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of \$707,000.



Increased employee productivity: 19% of total benefits

“The benefits of Amazon EFS are extraordinary. It makes science so much more efficient. We can choose the service that makes sense for a specific group and scale storage for large data sets and have a scientist managing that data via a user interface. It makes their scientific and business processes very efficient.”

– Director of informatics and data science, pharmaceutical company, US

Increased Employee Productivity					
Ref.	Metric	Source	Year 1	Year 2	Year 3
A1	Storage admin FTEs needed for storage administration, provisioning, and maintenance activities in previous environment	Year 1: Composite Years 2 and 3: $A1_{PY} * 1.25$	3	4	5
A2	Time spent on storage administration, provisioning, and maintenance activities in previous environment	Composite	20%	20%	20%
A3	Fully loaded annual salary per FTE	Year 1: Assumption Years 2 and 3: $A4_{PY} * 1.03$	\$101,250	\$104,288	\$107,416
A4	Cost in previous environment	$A1 * A2 * A3$	\$60,750	\$78,216	\$100,703
A5	Storage admin FTEs needed for storage administration, provisioning, and maintenance activities with Amazon EFS	Composite	3	3	3
A6	Decrease in time spent on storage provisioning and maintenance activities	Composite	90%	90%	90%
A7	Average time spent per storage admin on storage provisioning and maintenance activities with Amazon EFS	$A2 * (1 - A6)$	2%	2%	2%
A8	Cost with Amazon EFS	$A3 * A5 * A7$	\$6,075	\$6,257	\$6,445
A9	Subtotal: Storage admin FTE savings from moving to Amazon EFS	A4-A8	\$54,675	\$71,958	\$94,258
A10	Other FTEs (e.g., IT procurement team members, IT central team members, system admins) needed for procurement activities in previous environment	Composite	3	3	3
A11	Time spent on procurement activities for increasing file storage capacity in previous environment	Composite	2%	2%	2%
A12	Fully loaded annual salary per other FTE	Year 1: Assumption Years 2 and 3: $A12_{PY} * 1.03$	\$81,000	\$83,430	\$85,933
A13	Subtotal: Increased employee productivity	$A10 * A11 * A12$	\$4,860	\$5,006	\$5,156
A14	Decrease in time spent on procurement activities for increasing file storage capacity with Amazon EFS	Composite	100%	100%	100%
A15	Subtotal: Savings from other FTEs moving to Amazon EFS	$A13 * A14$	\$4,860	\$5,006	\$5,156
A16	Business users	Composite	333	343	354
A17	Percentage of time spent looking for/accessing data from disparate storage systems in previous environment	Composite	3%	3%	3%
A18	Reduction in time spent looking for/accessing data from disparate with Amazon EFS	Composite	25%	37.50%	56.25%
A19	Percentage of time saved	$A17 * A18$	0.75%	1.13%	1.69%
A20	Fully loaded annual salary per business user	Year 1: Assumption Years 2 and 3: $A20_{PY} * 1.03$	\$125,450	\$129,214	\$133,090
A21	Subtotal: Increased business user productivity (rounded)	$A16 * A19 * A20$	\$313,311	\$500,819	\$796,224
A22	Productivity conversion rate	Assumption	50%	50%	50%
Bt	Quality improvement and risk reduction	$B8 * B9$	\$129,444	\$406,824	\$554,760
	Risk adjustment	↓5%			
Btr	Quality improvement and risk reduction (risk-adjusted)		\$122,972	\$386,483	\$527,022
Three-year total: \$876,977			Three-year present value: \$707,448		

INCREMENTAL REVENUE FROM FASTER TIME-TO-MARKET

Evidence and data. Modern application delivery requires persistent cloud file storage capabilities. Interviewees said that adopting Amazon EFS made their organizations more agile by giving them the ability to grow and shrink their file storage capacities on demand. With no storage capacity and planning required, their organizations saw reduced lead times to set up storage environments, which led to faster time-to-value. Interviewees also reported greater flexibility in developing applications. Having on-demand storage, the ability to add Amazon EFS to workloads on the fly, and compatibility with NFS protocols gave applications developers more time to build innovative features, which accelerated software innovation.

This greater velocity yielded various benefits for the interviewed customers. Interviewees said:

- By enabling their organizations to scale their file storage up or down, Amazon EFS eliminated the procurement activities needed to increase file storage capacity. As a result, the average lead time required to set up storage environment was reduced by 98%.
- This also accelerated applications development by decreasing the time application developers spent on mundane tasks (e.g., applications configuration, compatibility, data persistence) by 15%.

Modeling and assumptions. Forrester assumes the following about the composite organization:

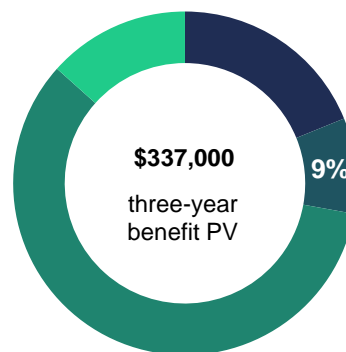
- The organization earns \$1 billion in annual revenue.
- The organization has an operating margin of 8%.
- The percentage of revenue attributable to Amazon EFS versus other technology, human skills, and process improvements is 2%.

- The average time needed to add storage in the previous environment was 30 days to procure, stack, and rack processes.
- Seven applications developers spend an average of 10% of their time working on applications security, scalability, and availability (e.g., apps configuration, compatibility, data persistence, etc.).
- The annual compensation for a business user is \$94,500, and this rises with inflation over time.

Risks. The impact of incremental revenue will vary with:

- Variances in annual revenue and operating margins.
- The number of application developers, and the amount of time spent on applications security, scalability, and availability activities.
- The fully loaded compensation of application developers.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of \$337,000.



Incremental revenue from faster time-to-market: 9% of total benefits

Incremental Revenue From Faster Time-To-Market					
Ref.	Metric	Source	Year 1	Year 2	Year 3
B1	Annual revenue	Composite	\$1,000,000,000	\$1,030,000,000	\$1,060,900,000
B2	Average time required to add storage (e.g., raise IT ticket, procure, stack, rack) in previous environment (days)	Composite	30	30	30
B3	Time reduction in setting up environment with Amazon EFS	Composite	98%	98%	98%
B4	Number of days saved with Amazon EFS	B2*B3	29.40	29.40	29.40
B5	Average revenue per day	B1/365 days	\$2,739,726	\$2,821,918	\$2,906,575
B6	Percentage of revenue/value attributable to file storage system versus other technology (e.g., EC2), human skills, and process improvements	Composite	2%	2%	2%
B7	Operating margin	Assumption	8%	8%	8%
B8	Subtotal: Incremental revenue from accelerated time to market (rounded)	B4*B5*B6*B7	\$128,877	\$132,743	\$136,725
B9	Applications developers needed to handle apps security, scalability, and availability in previous environment	Composite	7	7	7
B10	Time spent handling apps security, scalability, and availability in previous environment	Assumption	10%	10%	10%
B11	Fully loaded annual salary per FTE	Year 1: Assumption Years 2 and 3: B11 _{py} *1.03	\$94,500	\$97,335	\$100,255
B12	Cost in previous environment	B9*B10*B11	\$66,150	\$68,135	\$70,179
B13	Applications developers needed to handle apps security, scalability, and availability with Amazon EFS	Composite	7	7	7
B14	Decrease in time spent on handling apps security, scalability, and availability with Amazon EFS	Composite	15%	15%	15%
B15	Average time spent per app developers on handling apps security, scalability, and availability with Amazon EFS (rounded)	B10*(1-B14)	8.5%	8.5%	8.5%
B16	Cost with EFS (rounded)	B11*B13*B15	\$56,228	\$57,914	\$59,652
B17	Subtotal: Apps developer FTEs savings from moving to Amazon EFS	B12-B16	\$9,922	\$10,220	\$10,527
Bt	Quality improvement and risk reduction	B8*B9	\$129,444	\$406,824	\$554,760
	Risk adjustment	↓5%			
Btr	Quality improvement and risk reduction (risk-adjusted)		\$122,972	\$386,483	\$527,022
Three-year total: \$407,564			Three-year present value: \$337,217		

COST SAVINGS FROM RETIRING PREVIOUS SOLUTIONS AND IMPROVING STORAGE UTILIZATION

Evidence and data. Prior to using Amazon EFS, the interviewed organizations used multiple file storage solutions, including cloud open-source systems and on-premises infrastructure solutions made of disparate servers and hard drives in multiple locations. Implementing Amazon EFS enabled them to gradually retire these solutions and centralize their file storage in serverless environments.

In addition, the consumption-based model offered by Amazon EFS enabled the interviewed organizations to start billing file data storage usage as a granular GB-per-month operating expenses (opex) cost rather than a capital expenditure (capex) charge.

These enhancements yielded various benefits across the interviewed organizations including an average usable capacity improvement of 30%.

Modeling and assumptions. Forrester assumes the following about the composite organization:

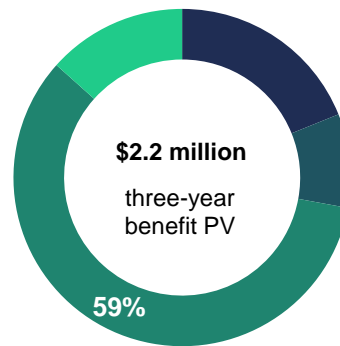
- The storage size of the file data storage migrated to Amazon EFS is 200 TB, and it increases by 20% year-over-year.

- The file storage fees in the previous environment were \$3,000 per TB.
- The average storage capacity utilization in the previous environment was 77%.

Risks. The impact of the cost savings will vary with:

- The storage capacity utilization in the previous environment.
- The prior solution’s pricing model and usage.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of \$2.2 million.



Cost savings from retiring previous solutions: 59% of total benefits

“A big benefit is that we don't need to think about the available storage size. Regardless of how much data we have, we know there will be storage availability on Amazon EFS. With our previous solution, we had to consider how much data we would acquire over a period of time and then size our storage solution based on this. At times, we made the decision to extend the storage solution more than we should have.”

– Cloud engineer, Bayer

“One of the biggest benefits is that we haven't had to put any management effort into Amazon EFS. We haven't had to deal with maintenance, which means we can use our resources on other priorities.”

– Cloud engineer, Bayer

Cost Savings From Retiring Previous Solutions And Improving Storage Utilization					
Ref.	Metric	Source	Year 1	Year 2	Year 3
C1	Storage capacity in previous environment replaced by Amazon EFS (TB)	Year 1: Composite Years 2 and 3: C1 _{PY} *1.2	200	240	288
C2	Average file storage fees per TB in previous environment	Assumption	\$3,000	\$3,000	\$3,000
C3	Subtotal: Cost saving from retiring previous environment	Composite	\$600,000	\$720,000	\$864,000
C4	Storage capacity utilization in previous environment	Composite	70%	77%	85%
C5	Storage capacity utilization in Amazon EFS	Composite	100%	100%	100%
C6	Usable capacity improvement with Amazon EFS (rounded)	(C5-C4)/C4	42.86%	29.87%	17.65%
C7	Subtotal: Cost saving from improved storage utilization with Amazon EFS	C1*C2*C6	\$257,160	\$215,064	\$152,496
Ct	Cost saving from retiring previous solutions and improved utilization	C3+C7	\$857,160	\$935,064	\$1,016,496
	Risk adjustment	↓5%			
Ctr	Cost saving from retiring previous solutions and improved utilization (risk-adjusted)		\$814,302	\$888,311	\$965,671
Three-year total: \$2,668,224			Three-year present value: \$2,199,939		

COST SAVINGS FROM IMPROVED DATA TRACEABILITY AND RETENTION

Evidence and data. Interviewees said their organizations saw improved data traceability and extended data retention policies with Amazon EFS than they experienced with their previous environments. For instance, one interviewee said their organization could only have a retention policy of three years in its previous environment but that it was able to increase that time to seven years with Amazon EFS. Eliminating scattered servers and hard drives by centralizing file data in Amazon EFS also enabled that organization to increase data security, increase data durability, mature data governance processes, and strengthen data traceability. These improvements yielded various benefits across the

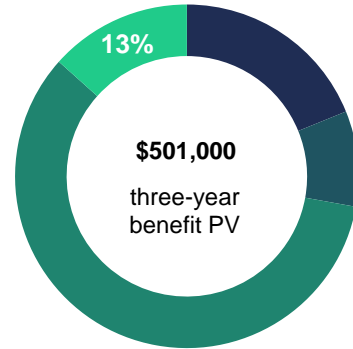
interviewed organizations, including a 90% average reduction in lost, misplaced, or deleted data with Amazon EFS.

Modeling and assumptions. Forrester assumes the following about the composite organization:

- The organization receives an average of 1,500 data samples (e.g., patient data, genomic sequencing data) per day.
- The average cost per data sample is \$800.
- With the previous file storage environment, the composite organization lost, misplaced, or deleted 15% of its file data samples each year.
- A 0.5% subsegment of the lost, misplaced, or deleted data required rework or reissuance (e.g., remapping a genomic sample).

Risks. The impact of the cost savings from improved data traceability and retention will vary with:

- The number of data samples.
- The average cost per data sample.
- The volume of data samples lost, misplaced, or deleted and that require rework.



Cost savings from improved data traceability and retention: 13% of total benefits

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of \$501,000.

Cost Savings From Improved Data Traceability And Retention					
Ref.	Metric	Source	Year 1	Year 2	Year 3
D1	Average number of data samples (e.g., patient data, genome sequences) per day	Composite	1,500	1,500	1,500
D2	Average cost per data sample	Composite	\$800	\$800	\$800
D3	Percentage of data samples lost/misplaced or deleted previous environment	Composite	15%	15%	15%
D4	Percentage of data that needs reissued or reworked by users/data scientists	Composite	0.5%	0.5%	0.5%
D5	Daily cost of lost, misplaced, or deleted data with previous environment	$D1 * D2 * D3 * D4$	\$900	\$900	\$900
D6	Reduction in lost, misplaced, or deleted data with Amazon EFS	Composite	90%	90%	90%
D7	Daily saving from improved data management and traceability with Amazon EFS	$D5 * D6$	\$810	\$810	\$810
Dt	Cost saving from improved data traceability and retention	$D7 * 262$	\$212,220	\$212,220	\$212,220
	Risk adjustment	↓5%			
Dtr	Cost saving from improved data traceability and retention (risk-adjusted)		\$201,609	\$201,609	\$201,609
Three-year total: \$604,827			Three-year present value: \$501,372		

UNQUANTIFIED BENEFITS

Additional benefits that customers experienced but were not able to quantify include:

- Improved file storage performance including higher data availability.
- Increased infrastructure resiliency.
- Improved customer experience by reducing downtime, outages, and customer-facing incidents.
- Enhanced employee experience and engagement by eliminating repetitive and burdensome tasks.
- Strengthened data privacy, archiving, and security.

FLEXIBILITY

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.

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might implement Amazon EFS and later realize additional uses and business opportunities, including:

- Deploying and integrating additional AWS services (e.g., Amazon EC2, AWS Lambda, Amazon ECS, Amazon EKS, AWS Fargate, and Amazon CloudWatch).
- Supporting a distributed workforce and business model.
- Helping to ensure business continuity during pandemics and disasters by accommodating significant spikes in data consumption, ensuring reliability, and adapting to new organizational needs with speed.

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

Analysis Of Costs

■ Quantified cost data as applied to the composite organization

Total Costs							
Ref.	Cost	Initial	Year 1	Year 2	Year 3	Total	Present Value
Etr	Amazon EFS storage fees	\$285,648	\$0	\$246,748	\$245,013	\$777,409	\$673,654
Ftr	Planning, implementation, and data migration costs	\$92,180	\$215,875	\$160,233	\$107,609	\$575,897	\$501,702
	Total costs (risk-adjusted)	\$377,828	\$215,875	\$406,980	\$352,623	\$1,353,305	\$1,175,356

AMAZON EFS STORAGE FEES

Evidence and data. Amazon EFS offers four storage classes, each with different characteristics and pricing. Pricing is based on the amount of storage required, the storage class, infrequent access calls, and throughput. The storage classes are:

- **Amazon EFS Standard.** Provides availability zone storage for active filesystem workloads requiring high durability and availability.
- **Amazon EFS Standard-Infrequent Access (IA).** Provides multi-availability zone storage for infrequently accessed files. Files move from standard to infrequent access based on default or user-initiated lifecycle management rules.
- **Amazon EFS One Zone.** Provides single availability zone storage for active file-system workloads. One Zone is a cost-effective solution for workloads that don't require the highest level of durability and availability.
- **Amazon EFS One Zone-Infrequent Access (One Zone-IA).** Provides single availability zone storage for infrequently accessed files. Files move from one zone to infrequent access based on default or user-initiated lifecycle management rules.

Each of the interviewees said their organization previously used both standard storage and standard IA storage. Amazon released EFS OneZone during the creation of this study, so the interviewed customers had not yet moved their workloads across.

Interviewed customers had varying levels of infrequent access utilization that averaged 68%. They also incurred data-access fees for accessing data from infrequent access as indicated in the model.

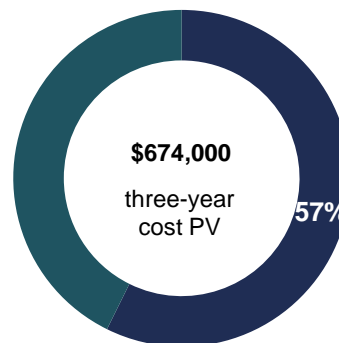
Modeling and assumptions. Forrester assumes the following about the composite organization:

- The organization initially stores 200 TB. This grows to 288 TB by Year 3.
- In Year 1, the organization stores 70% of its data in IA. This grows to 75% in Year 2 and to 80% in Year 3.
- Although the interviewed customers had not yet used the One Zone storage, Forrester assumes the composite organization will begin to utilize this storage class in years 2 and 3 due to the associated cost benefits. The assumption is that 12% of data will be stored in One Zone.
- The organizations is charged a fee to access data from IA. The data in IA is 10% in Year 1, 13% in Year 2, and 16% in Year 3.

Risks. Forrester uncovered low risks associated with the deployment of Amazon EFS. Risks identified include:

- Unintended costs due to higher-than-expected access to infrequent access data and/or the need to provision additional throughput.
- Regional pricing variations.

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 \$674,000.



Amazon EFS storage fees: 57% of total costs

AMAZON EFS THROUGHPUT MODES

Amazon EFS offers two modes of throughput: Bursting Throughput (which is provided as default) and Provisioned Throughput (which is optional). Bursting Throughput provides a baseline rate of 50 KB/s per GB of throughput included with the price of the standard storage class and read operations metered at a 1:3 ratio. Provisioned Throughput allows customer to provision additional throughput on an ongoing basis or when required to meet peak traffic.

Several interviewed customers were using Provisioned Throughput, but additional throughput isn't always a requirement. Organizations using Provisioned Throughput required that mode for an average of 11% of their storage. This leads to an additional cost of \$74,000 over three years.

Amazon EFS Storage Fees						
Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
E1	Data storage capacity GB per month	Composite	200,000		240,000	288,000
E2	Percentage of data stored in Amazon EFS Standard-IA	Composite	70%		75%	80%
E3	Percentage of data stored in Amazon EFS Standard	Composite	30%		13%	8%
E4	Percentage of data stored in Amazon EFS One Zone	Assumption	0%		12%	12%
E5	Percentage of data stored in Amazon EFS One Zone-IA	Assumption	0%		0%	0%
E6	Cost of 1GB per month with Amazon EFS Standard-IA	Composite	\$0.0250		\$0.0250	\$0.0250
E7	Cost of 1GB per month with Amazon EFS Standard	Composite	\$0.3000		\$0.3000	\$0.3000
E8	Cost of 1GB per month with Amazon EFS One Zone	Assumption	\$0.1600		\$0.1600	\$0.1600
E9	Percentage of IA data request	Assumption	10%		12.50%	15.63%
E10	Cost of IA request (per GB transferred)	Composite	\$0.0100		\$0.0100	\$0.0100
E11	Cost of IA request per month	$E1 * E2 * E9 * E10$	\$140		\$225	\$360
Et	Amazon EFS storage fees	$((E1 * E2 * E6) + (E1 * E3 * E7) + (E1 * E4 * E8) + E11) * 12$	\$259,680	\$0	\$224,316	\$222,739
	Risk adjustment	↑10%				
Etr	Amazon EFS storage fees (risk-adjusted)		\$285,648	\$0	\$246,748	\$245,013
Three-year total: \$777,409			Three-year present value: \$673,654			

PLANNING, IMPLEMENTATION, AND DATA MIGRATION COSTS

Evidence and data. Interviewees said that moving to Amazon EFS was relatively fast and easy and that their organizations were able to transition from pilot to operational services in less than six months.

Their organizations incurred costs related to moving to a new service, but the interviewees also outlined costs associated with planning and implementing Amazon EFS, subsequent time spent on data migration and retirement of previous solutions, and training time to ensure effective use of the service.

They went through pilots and proofs of capability or test phases as part of their assessment processes, and the subsequent findings formed part of the assumptions for planning and implementation. After implementation, the organizations gradually migrated data to Amazon EFS. A cloud engineer from Bayer said it took between 30 and 90 days to fully migrate data and to ensure all applications used the service. Other interviewees provided timeframes ranging from two to six months.

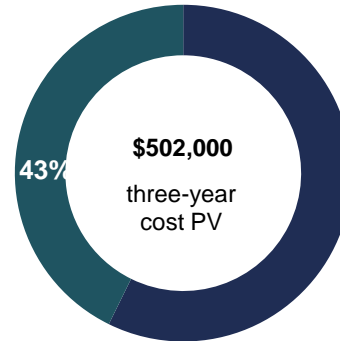
Modeling and assumptions. Forrester assumes the following about the composite organization:

- Implementation, migration, and training costs assume an in-house approach led by current employees only spending part of their full-time roles on the activities required to complete the operational standup of the Amazon EFS service.
- The organization requires five FTEs spending an average of 30% of their time on implementation for five months
- The annual compensation for individuals who manage implementation is \$101,250.
- During Year 1, six FTEs spend an average of 30% of their time migrating data and retiring existing solutions.
- The annual compensation for an individual in charge of migrating data is \$104,288, and this rises with inflation over time.
- To ensure their organization gets the most out of its investment in Amazon EFS, five staff members receive the equivalent of two weeks of training in Year 1. In subsequent years, the organization trains three FTEs during one week to ensure the staff is keeping up across new features and service updates.

Risks. Forrester uncovered low to medium risks associated with the deployment of Amazon EFS. Risks identified include:

- The complexity of the existing IT environment to be replaced and integrated.
- Planning, implementation, and training time, which is influenced by whether or not an organization currently uses other AWS services.

Results. To account for these risks, Forrester adjusted this cost upward by 15%, yielding a three-year, risk-adjusted total PV of \$502,000.



Planning, implementation, and data migration costs: 43% of total costs

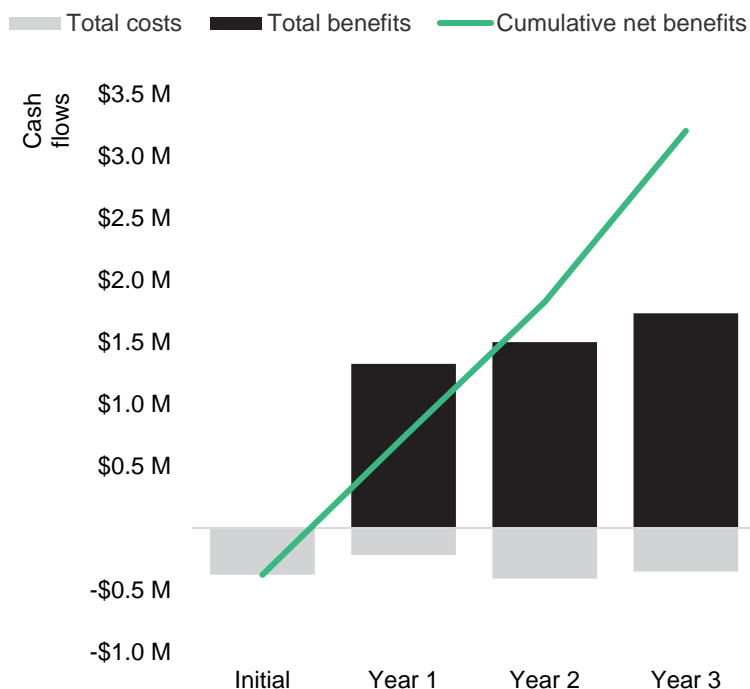
Planning, Implementation, And Data Migration Costs

Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
F1	Time needed for EFS planning and implementation (months)	Composite	5			
F2	FTEs needed for EFS implementation	Composite	5			
F3	Percentage of FTE time spent on implementation	Composite	30%			
F4	Fully loaded annual salary per FTE	Assumption	\$101,250			
F5	Subtotal: Cost of FTE working on EFS implementation	$F1 \cdot F2 \cdot F3 \cdot (F4/12)$	\$63,281			
F6	FTEs needed to migrate data, retire previous solutions, etc.	Composite		6	5	4
F7	Percentage of FTE time	Composite		30%	25%	20%
F8	Fully loaded annual salary per FTE (rounded)	Assumption		\$104,288	\$107,416	\$110,639
F9	Subtotal: Cost of FTE needed for EFS data migration, operations, and retirement of previous solutions	$F6 \cdot F7 \cdot F8$		\$187,718	\$134,270	\$88,511
F10	Duration of training (weeks)	Composite	2		1	1
F11	Number of FTEs who are trained	Composite	5		3	3
F12	Fully loaded annual salary per FTE	Assumption	\$87,750		\$87,750	\$87,750
F13	Subtotal: Cost of training (rounded)	$(F12/52) \cdot F10 \cdot F11$	\$16,875		\$5,063	\$5,063
Ft	Planning, implementation, and data migration costs	$F5 + F9 + F13$	\$80,156	\$187,718	\$139,333	\$93,573
	Risk adjustment	↑15%				
Ftr	Planning, implementation, and data migration costs (risk-adjusted)		\$92,180	\$215,875	\$160,233	\$107,609
Three-year total: \$575,897			Three-year present value: \$501,702			

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	(\$377,828)	(\$215,875)	(\$406,980)	(\$352,623)	(\$1,353,305)	(\$1,175,356)
Total benefits	\$0	\$1,324,872	\$1,500,182	\$1,732,597	\$4,557,651	\$3,745,976
Net benefits	(\$377,828)	\$1,108,997	\$1,093,202	\$1,379,974	\$3,204,346	\$2,570,620
ROI						219%
Payback						<6 months

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.

FORRESTER®