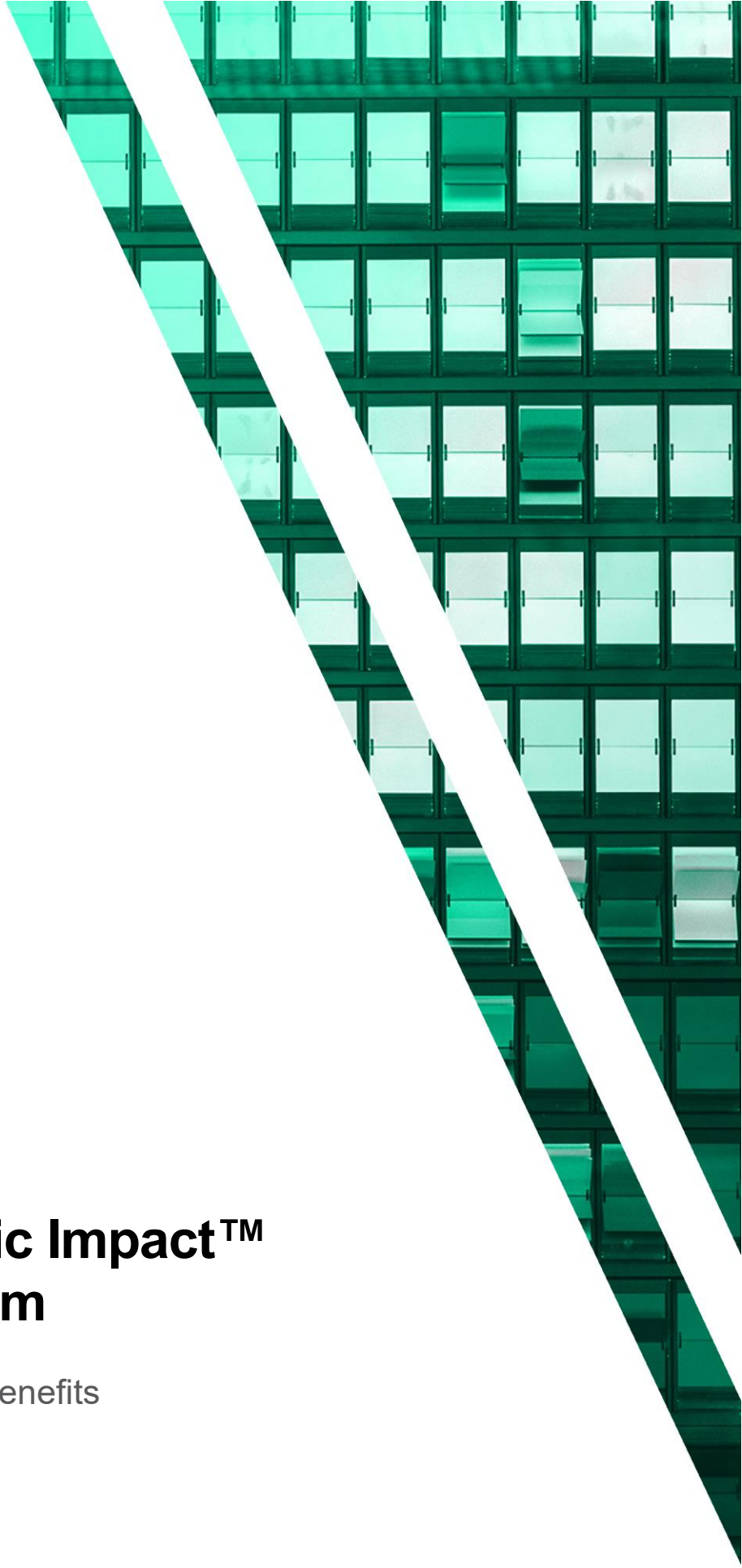
FORRESTER®



The Total Economic Impact™ Of IBM FlashSystem

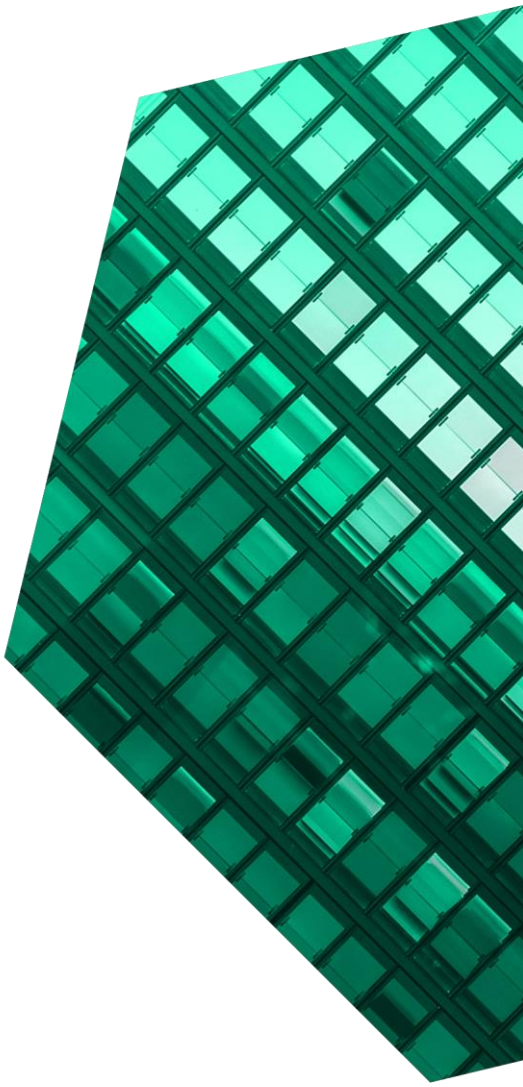
Cost Savings And Business Benefits Enabled By FlashSystem

FEBRUARY 2022

A FORRESTER TOTAL ECONOMIC IMPACT™ STUDY COMMISSIONED BY IBM

Table Of Contents

Consulting Team: Kris Peterson



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.

Executive Summary

IBM FlashSystem provides an opportunity for organizations to modernize their existing storage environments, improve data resiliency, and avoid costly capacity expansions. Organizations that deploy this solution typically reduce storage costs, increase operational efficiencies, and reduce downtime.

IBM FlashSystem — built with IBM Spectrum Virtualize software — enables organizations to manage disparate storage environments and growing data capacity requirements with less effort.

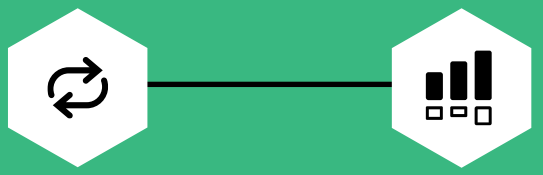
IBM commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying FlashSystem.[1] The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of FlashSystem on their organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed five decision-makers with experience using FlashSystem. For the purposes of this study, Forrester aggregated the interviewees' experiences and combined the results into a single composite organization.

Prior to using FlashSystem, the interviewees' organizations faced costly capacity expansions and increasing efforts from storage admins to manage their complex environments. Limited or nonexistent virtualization capabilities led to planned and unplanned downtime that impacted critical business functions.

After investing in FlashSystem, interviewees' organizations mitigated the current need to purchase additional storage capacity, reduced the effort needed to manage the environment, and reduced downtime.

KEY STATISTICS



Return on investment (ROI)
305%

Net present value (NPV)
$1.55M

KEY FINDINGS

Quantified benefits. Risk-adjusted present value (PV) quantified benefits include:

- **Reduced storage costs by $837,000.** Interviewees said FlashSystem compresses data with minimal impact to performance of the environment if it impacts it at all. This reduces or eliminates the need to purchase additional capacity and also reduces data center costs.
- **Increased operational efficiency worth $695,000.** Interviewees said FlashSystem greatly reduces the effort needed to manage the storage environment, freeing up over 90% of FTE time to work on other value-added tasks.
- **Reduced downtime worth $528,000.** The reliability of FlashSystem along with the ability to perform updates, patches, maintenance, and other work on the storage environment without taking any hardware offline reduces the planned

and unplanned downtime experienced by organizations.

Unquantified benefits. Benefits that are not quantified for this study include:

- **Improved application performance.** Interviewees said FlashSystem greatly improved the performance of their organizations' applications and the storage environments.
- **Enhanced security.** Proactive scans and system patches enhance security postures with early identification and remediation of any potential vulnerabilities.
- **IBM support and partner network.** Interviewees said IBM provides unrivaled product support that assists organizations in properly deploying the solution and maximizing the benefits of particular use cases.

Costs. Risk-adjusted PV costs include:

- **Cost of FlashSystem.** FlashSystem comes with features including IBM Spectrum Virtualize and IBM Storage Insights, and the cost includes setup. The composite organization pays a total cost of $505,000, and that includes the ongoing maintenance of the units
- **Cost of training and integration time.** Interviewees said their organizations paid for training on FlashSystem and integration, valued at $4,000.

The decision-maker interviews and financial analysis found that a composite organization experiences benefits of $2.06 million over three years versus costs of $509,000, adding up to a net present value (NPV) of $1.55 million and an ROI of 305%.

> **Since we implemented FlashSystem, we never had any downtime on the service system."**
>
> — Head of technology infrastructure operations, financial services

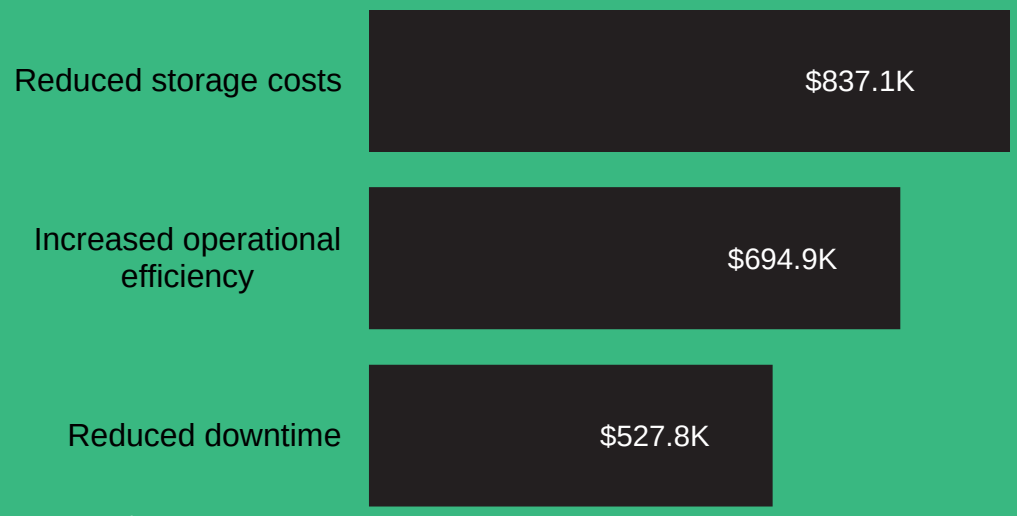
ROI
305%

BENEFITS PV
$2.06M

NPV
$1.55M

PAYBACK
8 months

Benefits (Three-Year)



[FlashSystem] really exemplifies … the reputation that IBM has with reliability, scalability, [and] security. We've been very impressed and very happy with the decision to go with [FlashSystem].

— Infrastructure architect, manufacturing

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 FlashSystem.

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 FlashSystem can have on an organization.

DUE DILIGENCE

Interviewed IBM stakeholders and Forrester analysts to gather data relative to FlashSystem.

DECISION-MAKER INTERVIEWS

Interviewed five decision-makers at organizations using FlashSystem to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION

Designed a composite organization based on characteristics of the interviewees' organizations.

FINANCIAL MODEL FRAMEWORK

Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the decision-makers.

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 IBM FlashSystem Customer Journey

Drivers leading to the investment in FlashSystem

Interviewed Decision-Makers

Interviewee	Sector	Region	Data managed	Storage admins
Head of technology infrastructure operations	Financial services	Africa	1 PB	4
Lead systems engineer	Healthcare	North America	3 PB	2
Infrastructure architect	Manufacturing	North America	100 TB	1
Global head storage engineer	Pharmaceutical	Global	8 PB	1
Systems engineer	Manufacturing	Global	2 PB	2

KEY CHALLENGES

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

- **Disparate legacy storage solutions required excessive effort to manage.** Interviewees told Forrester their organizations needed multiple FTEs to manage their environments prior to using FlashSystem. They said that increasing data needs increasing meant their organizations faced costly capacity expansions that would require more FTEs to manage and increase data center costs.
- **Planned and unplanned downtime impacting business operations.** Many organizations do not operate within a standard set of business hours, and interviewees said that created a need for a reliable storage solution that does not need to be taken offline for routine maintenance or critical updates. A global head storage engineer in the pharmaceutical industry said: "Having a system that doesn't require downtime is huge because, [for] global companies, it's hard to find a downtime when everything runs all the time. You have a regional data center or a global data center, [so] just because it's nighttime [where you are], it doesn't mean 50,000 people aren't using it."

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 five decision-makers that Forrester interviewed and is used to present the aggregate financial analysis in the next section.

Description of composite. The composite organization operates out of multiple locations and two experienced storage admins manage its mix of multivendor storage solutions holding 1 PB of data. Business users are impacted by planned and unplanned downtime and, with 15% annual growth in data, the organization needs to expand capacity and allocate additional FTEs to manage its increasingly complicated and unreliable environment.

Key assumptions

- **Multivendor storage**
- **1 PB of data**
- **15% annual growth**

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	Reduced storage costs	$292,125	$339,625	$387,125	$1,018,875	$837,103
Btr	Increased operational efficiency	$220,448	$283,433	$346,418	$850,298	$694,917
Ctr	Reduced downtime	$190,000	$213,750	$237,500	$641,250	$527,817
	Total benefits (risk-adjusted)	$702,573	$836,808	$971,043	$2,510,423	$2,059,837

REDUCED STORAGE COSTS

Evidence and data. FlashSystem compresses data to maximize capacity utilization, which leads to reduced storage costs because organizations can avoid purchasing additional capacity and incurring the associated cost of expanding data centers.

- A head of technology infrastructure operations in the financial services industry said: "The feature that really stood out for me is the compression and the deduplication. … If we have to use the conventional storage system, I [need capacity for a] petabyte. But with this FlashSystem, we're able to compress [and] gain a ratio of like 1:5."
- The same interviewee said: "We are able to save some cost in term of capex. I think it's phenomenal in terms of cost. … Before, we normally spent between $1 million to $2 million every year. But with [FlashSystem] … we have not acquired additional capacity."
- An infrastructure architect in the manufacturing industry said FlashSystem reduced storage costs. They said: "We do use compression a lot, and that has saved us tremendously in terms of costs because we're doing compression and getting [a compression rate of] about 3:1. We're able to store more data and that has helped us to not have to expand as much as we would have if we didn't use compression. If we didn't have the compression, then we would have to spend a lot more money to expand our storage capacity."
- A global head storage engineer in the pharmaceutical industry said: "[FlashSystem uses] less space, less heat, [and] less electricity in that section of the data center. … When we went from spinning disk [technology] to Flash, it was one-tenth the power consumption, which loosely translated to one-tenth of the heat output."

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

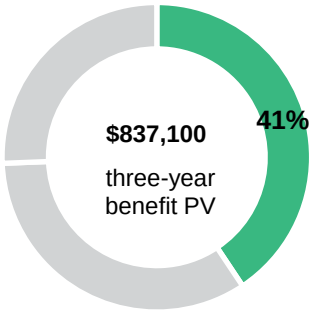
> **"FlashSystem enables us to reduce cost in terms of footprint and in terms of cooling and power."**
>
> *Head of technology infrastructure operations, financial services*

- Using FlashSystem, the composite avoids purchasing additional capacity of 150 TB in Year 1, 175 TB in Year 2, and 200 TB in Year 3.
- The cost of additional capacity is $2,000 per terabyte.
- Using FlashSystem, the composite avoids installing an additional rack in the data center. This saves $7,500 per year in power and cooling costs.

Risks. The value of this benefit can vary across organizations due to:

- The organization's requirements for additional storage capacity.
- The organization's data center costs.

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 $837,100.



Reduced Storage Costs

Ref.	Metric	Source	Year 1	Year 2	Year 3
A1	Capacity purchase avoided (TB)	Interview	150	175	200
A2	Average cost of capacity per TB	Assumption	$2,000	$2,000	$2,000
A3	Racks avoided with FlashSystem	Interview	1	1	1
A4	Data center costs savings per rack	Assumption	$7,500	$7,500	$7,500
At	Reduced storage costs	(A1*A2)+(A3*A4)	$307,500	$357,500	$407,500
	Risk adjustment	↓5%			
Atr	Reduced storage costs (risk-adjusted)		$292,125	$339,625	$387,125
	Three-year total: $1,018,875			**Three-year present value: $837,103**	

INCREASED OPERATIONAL EFFICIENCY

Evidence and data. Interviewees told Forrester that IBM FlashSystem reduced the effort their organizations needed to manage their storage environments and perform other tasks such as batch processing and provisioning due to the ease of managing the solution, increased performance, and other features such as IBM Storage Insights.

- An infrastructure architect in the manufacturing industry told Forrester: "The [FlashSystem] environment is so stable. It doesn't require a whole lot of care and feeding, so it allows me to spend a lot more time on the other hats that I wear. … I am the only [employee who] supports it, so I like the fact that the web interface is really easy to manage and straightforward for someone [who doesn't have] a storage background."

- The same interviewee said: "[The time I spend managing FlashSystem is] very minimal because once you set up the environment, unless there are issues, you really don't have to touch it. … It's been a couple weeks since I've done that."
- A lead systems engineer in the healthcare industry said: "[IBM Storage] Insights is nice because it's included for free, and now I can take all of my IBM stuff … and I have a single dashboard and then it's nicely integrated for support. … Now I have a single-vendor administrative viewpoint. We've been able to repurpose the time slice that I do storage." They also said that without FlashSystem, their organization would require another FTE.
- A global head storage engineer in the pharmaceutical industry said: "[FlashSystem is] simple enough to use that we can hand off daily operations to a third-party provider. … It is simple enough that we can outsource it without needing high-end people in terms of running it. … Regular operations can be managed by a lower-skilled person without breaking stuff. I find it more efficient in that respect: You don't need to tune it all the time. You don't need high-end people to make it work."

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

- The composite required two FTEs to manage its legacy solution in Year 1.
- As the data managed increased year-over-year, the composite needed additional FTE time to manage its legacy environment. The number of FTEs required increases to 2.5 in Year 2 and to three in Year 3.
- FlashSystem reduces the number of FTEs required to 0.25.
- The composite applies 85% of the time saved to other value-added tasks.

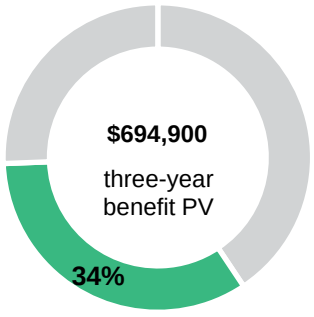
> **"The thing I really love about the IBM hardware is that it doesn't have many problems. It's very reliable. I could go a week or two without even ever having to log in to the FlashSystem GUI (graphical user interface) to do anything."**
>
> *Infrastructure architect, manufacturing*

- The fully burdened annual salary for an experienced storage admin is $156,000.

Risks. The value of this benefit can vary across organizations due to:

- The size and complexity of the organization's environment.
- The availability of other value-added tasks for personnel who perform storage admin tasks.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of $694,900.



Increased Operational Efficiency					
Ref.	**Metric**	**Source**	**Year 1**	**Year 2**	**Year 3**
B1	FTEs needed to manage storage in legacy environment	Interviews	2.00	2.50	3.00
B2	FTEs needed to manage storage with IBM FlashSystem	Interviews	0.25	0.25	0.25
B3	FTEs freed for other value-added tasks	B1-B2	1.75	2.25	2.75
B4	Productivity recapture	Assumption	85%	85%	85%
B5	Fully loaded annual salary for experienced storage admin	TEI Standard	$156,000	$156,000	$156,000
Bt	Increased operational efficiency	B3*B4*B5	$232,050	$298,350	$364,650
	Risk adjustment	↓5%			
Btr	Increased operational efficiency (risk-adjusted)		$220,448	$283,433	$346,418
	Three-year total: $850,298			**Three-year present value: $694,917**	

REDUCED DOWNTIME

Evidence and data. Interviewees said IBM Spectrum Virtualize reduced the disruptions and downtime their organizations experienced prior to deploying FlashSystem.

- A lead systems engineer in the healthcare industry said: "[IBM Storage] Insights helps you reduce downtime by keeping you alerted to both drive and controller issues so you can be proactive and not hit the scenario. … [FlashSystem] helped us avoid outages because I was able to move things so easily and transparently off of a problem area."
- An infrastructure architect in the manufacturing industry said: "With the Flash environment, we have not had any failures of the Flash drives in the six years that we've had this platform in place. That's pretty impressive."
- A global head storage engineer in the pharmaceutical industry said: "As the equipment improves, you can run more activities without needing to request downtime [for] upgrades, updates, security, patches, etc. … More components can be replaced without bringing the system down, and more components can be upgraded without affecting operations. That means there's less planned downtime because

"[FlashSystem] increased efficiency and ease of use. … Compared to other storage systems we have in the ecosystem … the ease of management [and] administration [and] performance [are] top notch."

Head of technology infrastructure operations, financial services

we don't need to have a window to do most of our maintenance, if not all of it." They also said their organization saved an average of "a couple months."

- In regard to the business impact of downtime, the same interviewee said: "If you're out and you can't distribute product — whether it's the actual end product or a middle-tier compound — that can be millions of dollars a day. And we're relying on the system to be up so that we don't have that [impact]. [Fines for regulatory compliance violations are] substantial … probably millions [of dollars]."
- The same interviewee said hardware design also contributes to reduced downtime. They said: "[We've] got less cabling, so [there are] physically [fewer] places for things to break. [Compared to our prior solution], our physical cabling requirements dropped three times. … If something breaks, troubleshooting is a lot easier."

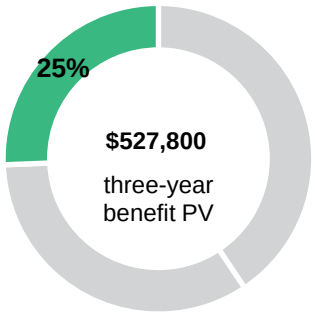
Modeling and assumptions. Forrester assumes the following about the composite organization:

- The composite's legacy solution experienced 50 hours of planned and unplanned downtime in Year 1. This increased five hours per year.
- FlashSystem eliminates the 10% of downtime that previously impacted the composite's mission-critical data.
- The business impact of downtime for the composite is $50,000 per hour.

Risks. The value of this benefit can vary across organizations due to:

- The size and complexity of the organization's environment.
- The ability of the organization's internal staff to mitigate and resolve system downtime.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of $527,800.



Reduced Downtime

Ref.	Metric	Source	Year 1	Year 2	Year 3
C1	Time of downtime with legacy solution (hours)	Interviews	40	45	50
C2	Percent of downtime impacting mission critical data	Interviews	10%	10%	10%
C3	Business impact per hour of downtime	Interviews	$50,000	$50,000	$50,000
Ct	Reduced downtime	C1*C2*C3	$200,000	$225,000	$250,000
	Risk adjustment	↓5%			
Ctr	Reduced downtime (risk-adjusted)		$190,000	$213,750	$237,500
	Three-year total: $641,250			**Three-year present value: $527,817**	

UNQUANTIFIED BENEFITS

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

- **Improved application performance.** A global head storage engineer in the pharmaceutical industry said: "[FlashSystem is] much faster than our apps need. [There will always be some] bottleneck [in the environment], whether it's the application, the database, the host, or the networking. … Updates [are made] and someone [else] is left being the bottleneck, and then they update and they're ahead of everybody else. Right now, at least for our use cases, it feels like [FlashSystem] made the leap and everybody else is catching up."

  An infrastructure architect in the manufacturing industry said: "It's just a huge performance improvement from [our previous solution] to where we are now. … With the improvements of the timing, [we're] able to do more [and] process more data now because it doesn't take as long. Our throughput has improved because of this."
- **Enhanced security.** A global head storage engineer in the pharmaceutical industry said: "[FlashSystem] reduces the work to patch it. Because we're getting scanned once a week, [the scans are] finding any vulnerability in SSL (secure sockets layer) or SSH (secure shell) type access. … The normal patch cycle we do has been efficient at keeping the security [team] from escalating [any issues]."
- **IBM support and partner network.** Interviewees said having integrated IBM support facilitates the resolution of any questions or issues that arise. An infrastructure architect in the manufacturing industry said: "Because we have [IBM] Storage Insights in place, the IBM engineers can go ahead and pull log information from our systems without having to wait for us. That helps to make problem resolution much faster."

FLEXIBILITY

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

- **Having an intuitive interface and features that less-experienced personnel can effectively manage.** Interviewees said FlashSystem's interface is easy to use and that they appreciate being able to assign less-experienced personnel to manage the solution.
- **Having customizable APIs allows organizations to integrate and automate workflows.** An infrastructure architect in the manufacturing industry told Forrester: "I've written scripts to help to interface with [FlashSystem] to make my job a little bit easier. The API allows me to be able to do scripting to help [with] some of the day-to-day stuff, so I don't even have to go into the GUI if I don't want to for some of the tasks that I do."

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

"[IBM] has the best product at the best price."

Lead systems engineer, healthcare

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**
Dtr	Cost of IBM FlashSystem	$430,000	$30,000	$30,000	$30,000	$520,000	$504,606
Etr	Cost of training and integration time	$2,268	$2,268	$0	$0	$4,536	$4,330
	Total costs (risk-adjusted)	$432,268	$32,268	$30,000	$30,000	$524,536	$508,936

COST OF IBM FLASHSYSTEM

Evidence and data. FlashSystem is currently available in five different models for a wide range of organizational requirements. All models include IBM Spectrum Virtualize and IBM Storage Insights.

- A global head storage engineer in the pharmaceutical industry told Forrester: "We do a capex model, so we buy it, and we depreciate it over the period, but we don't have surprise costs that show up. … From a budgeting perspective, it keeps it … predictable."
- The same interviewee said: "[Deploying FlashSystem] requires very little planning on our part. … It's simple. It's got a simple amount of cabling [and] networking. All the pieces that you need to rack and stack it are straightforward. The ordering process is straightforward. … It's a very standardized, simple approach.'"

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

- The composite purchases two FlashSystem units with setup for $430,000.
- The composite pays $30,000 in ongoing annual maintenance costs per year.

Risks. This cost can vary due to:

- The FlashSystem model the organization deploys.
- The organization's required service options.

Results. This yields a three-year, risk-adjusted total PV (discounted at 10%) of $505,000.

Cost Of IBM FlashSystem						
Ref.	**Metric**	**Source**	**Initial**	**Year 1**	**Year 2**	**Year 3**
D1	IBM FlashSystem with setup	Interviews	$430,000			
D2	Annual maintenance	Interviews	$0	$30,000	$30,000	$30,000
Dt	Cost of IBM FlashSystem	D1+D2	$430,000	$30,000	$30,000	$30,000
	Risk adjustment	0%				
Dtr	Cost of IBM FlashSystem (risk-adjusted)		$430,000	$30,000	$30,000	$30,000
	Three-year total: $520,000			**Three-year present value: $504,606**		

COST OF TRAINING AND INTEGRATION TIME

Evidence and data. Interviewees said storage admins required minimal time to learn to utilize the features of FlashSystem and integrate them into their environments.

- An infrastructure architect in the manufacturing industry told Forrester: "I took a one-week class and, outside of that, I went to a one-day seminar that IBM put on locally. Those were the only two training sessions that I was involved in outside of just reading documentation."
- A lead systems engineer in the healthcare industry said: "I have storage people that don't necessarily know IBM, and they're quickly up to speed because of interfaces [are] simple and consistent. ... [For a] lot of the basic stuff, I would say [it takes] at most a week spread out over a year to get to medium- to upper-levels of tasks."

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

- One storage admin spends 40 hours learning how to manage FlashSystem and optimizing the integration after deployment.
- A second storage admin spends 40 hours learning how to manage FlashSystem by the end of Year 1.

Risks. The cost of training and integration time can vary across organizations due to:

- The experience and skill set of the organization's internal staff.
- The size and complexity of the organization's environments.

Results. To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year, risk-adjusted total PV of $4,000.

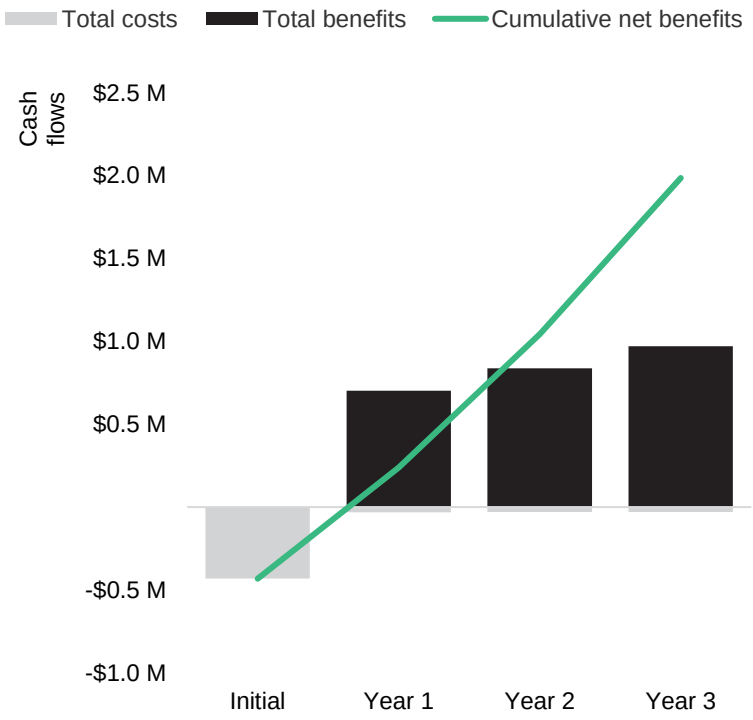
Cost Of Training And Integration Time

Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
E1	Storage admins managing IBM FlashSystem	Interviews	1	1	0	0
E2	Time of training and integration of solution into environment (hours)	Interviews	40	40	0	0
E3	Fully loaded hourly compensation	TEI Standard	$54	$54	$54	$54
Et	Cost of training and integration time	E1*E2*E3	$2,160	$2,160	$0	$0
	Risk adjustment	↑5%				
Etr	Cost of training and integration time (risk-adjusted)		$2,268	$2,268	$0	$0
	Three-year total: $4,536			**Three-year present value: $4,330**		

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	($432,268)	($32,268)	($30,000)	($30,000)	($524,536)	($508,936)
Total benefits	$0	$702,573	$836,808	$971,043	$2,510,423	$2,059,837
Net benefits	($432,268)	$670,305	$806,808	$941,043	$1,985,887	$1,550,901
ROI						305%
Payback						8 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.

Appendix B: Endnotes

[1] 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.


FORRESTER®