

NEW TECH

New Technology: The Projected Total Economic Impact™ Of The GE Healthcare Edison True PACS Solution

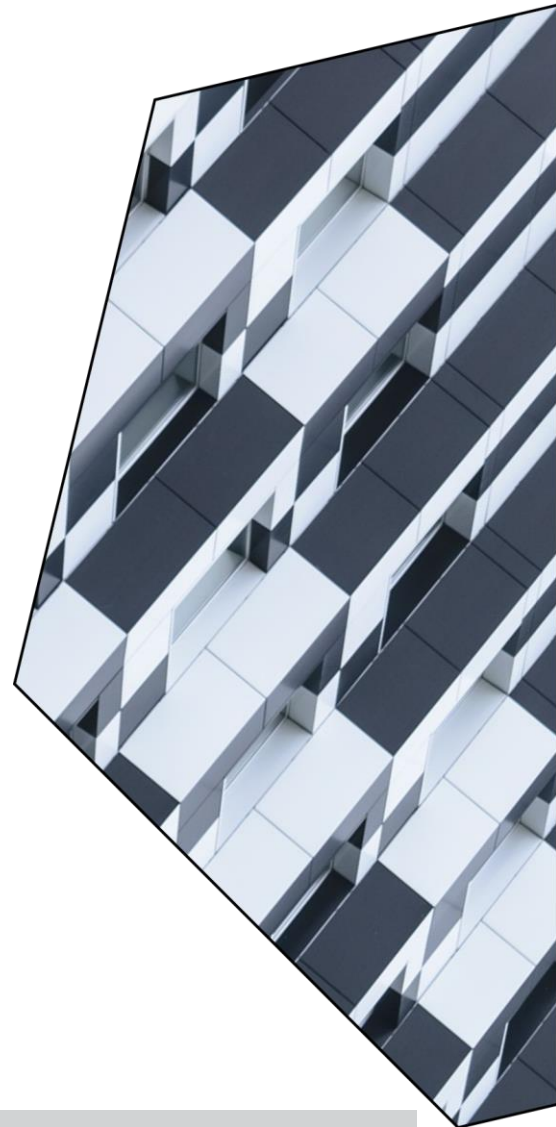
Cost Savings And Business Benefits
Enabled By The Edison True PACS solution

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Executive Summary

As cloud technology offerings continue to advance, providers are increasingly looking to cloud-based medical imaging technologies to improve their employee productivity, imaging technology-related expenses, and patient experiences. By adopting cloud-based imaging technology, providers more easily adopt advanced technologies like artificial intelligence and workflow automation optimization, while integrating various other medical systems to further improve their abilities to meet their patients' healthcare needs.

GE Healthcare offers a cloud-based picture archiving and communication system (PACS) called [Edison™ True PACS](#) that enables healthcare providers to improve patient experience thanks to enhancing the efficiency of the medical imaging workflows and reducing the high time and monetary costs of maintaining an on-premises PACS. The Edison True PACS solution contains Universal Viewer, Enterprise Archive, Centricity Zero Footprint Viewer, Open AI Orchestrator, and third-party AI applications. Combined, these enable the simple integration of artificial intelligence and workflow automation optimization, easier integration with other healthcare IT systems like electronic medical records (EMRs), and a reduction in the likelihood of both downtime and security breaches that impact patients and providers alike.

GE Healthcare commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by investing in the cloud-based Edison True PACS solution software as a service.¹ The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the Edison True PACS solution on their organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed three representatives and surveyed 32 representatives with experience using on-premises PACS solutions and who were investigating an

KEY STATISTICS



Projected return on investment (ROI)
56% to 202%



Projected net present value (NPV)
\$1.3M to \$4.8M

organizational investment in a cloud-based PACS. Because the Edison True PACS solution is only available in the United States, all representatives interviewed are based there. For the purposes of this study, Forrester aggregated the interviewees' and survey respondents' experiences and combined the results into a single [composite organization](#) that is a healthcare organization that produces and stores 225,000 images annually with 20 radiologists.

Interviewees and survey respondents noted that while using on-premises PACS, their organizations struggled with the high costs of infrastructure maintenance and PACS upgrades, downtime risks and associated costs to provider productivity and patient experience, managing technology integrations while maintaining security standards, and frequent support issues stemming from end-of-life software.

Interviewees and survey respondents estimated that after a potential investment in the Edison True PACS

solution, their organizations would improve their abilities to meet patients' healthcare needs while running more cost-efficient organizations. These benefits included improving radiologist and PACS administrator productivity, reducing the risk of security breaches and downtime, and reducing technology expenses and labor costs associated with maintaining an on-premises PACS.

KEY FINDINGS

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

- **Reduced on-premises PACS technology expenses.** By moving away from an on-premises PACS to GE Healthcare's cloud-based Edison True PACS solution, the composite is able to significantly reduce its technology expenses directly associated with its on-premises PACS. These expenses include software licensing fees, hardware costs and maintenance fees, real estate and utilities costs for on-premises hardware, on-premises storage and backup costs, on-premises security solution and penetration-testing services costs, and PACS upgrade and expansion costs.
- **Improved PACS-related productivity of between 13% (low) and 38% (high).** The Edison True PACS solution brings the composite organization a number of benefits that improve the productivity of radiologists and PACS administrators. These include streamlined file sharing, easier technology integrations, and the addition of third-party artificial intelligence and automation.
- **Reduced infrastructure management costs of between 40% (low) and 60% (high).** Adopting a cloud-based PACS solution also reduces the composite's prior labor expenses previously associated with managing the on-premises infrastructure associated with its on-premises PACS solution. Because not all of this infrastructure would be removed completely, and IT professionals will still be needed to manage some aspects of the cloud-based solution, the composite is estimated to save between 40% and 60% of its prior labor expenses.
- **Reduced risk of a PACS-related security breach of between 30% (low) and 50% (high).** With an on-premises PACS, the composite struggled with the complexity and resource cost needed to manage both the technology and its security. By shifting to the Edison True PACS solution, security of the cloud-based PACS is essentially outsourced, potentially freeing IT resources, but also reducing the risk of a PACS-related security breaches and the ensuing negative impact to productivity such as breaches could have on employees.
- **Reduced costs of downtime of between 90% (low) and 99% (high).** Similarly, the composite struggled to maintain uptime with its on-premises solution given the costs associated with high availability, backup, and recovery. By shifting to a cloud-based PACS, the composite reduces the likelihood of downtime and its associated costs, including lost revenues, regulatory fines, and the labor costs associated with troubleshooting the downtime event.

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

- **Improved ability to meet care demands.** Because the Edison True PACS solution reduces the composite's downtime, it also helps to improve the composite's unquantified ability to meet care demands by seeing patients on time and providing healthcare on a shorter timeline.
- **Shifting capex to opex.** By moving from a capex-based on-premises solution to a cloud-based PACS, the composite also benefits from the visibility and predictability of billing, which reduces the stress of having to find budget for

new expansions or overinvesting in infrastructure that is not needed in the end.

- **Improved partner and patient experience.** Improved technology integrations and better security mean that the Edison True PACS solution enables the composite to share medical images with patients and partners with less friction, improving these stakeholders' experiences working with the composite.
- **Reduced risk of accreditation loss.** By reducing downtime, the Edison True PACS solution reduces the composite's patient diversion times, which would otherwise negatively impact its American College of Surgeons (ACS) or trauma accreditations.

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

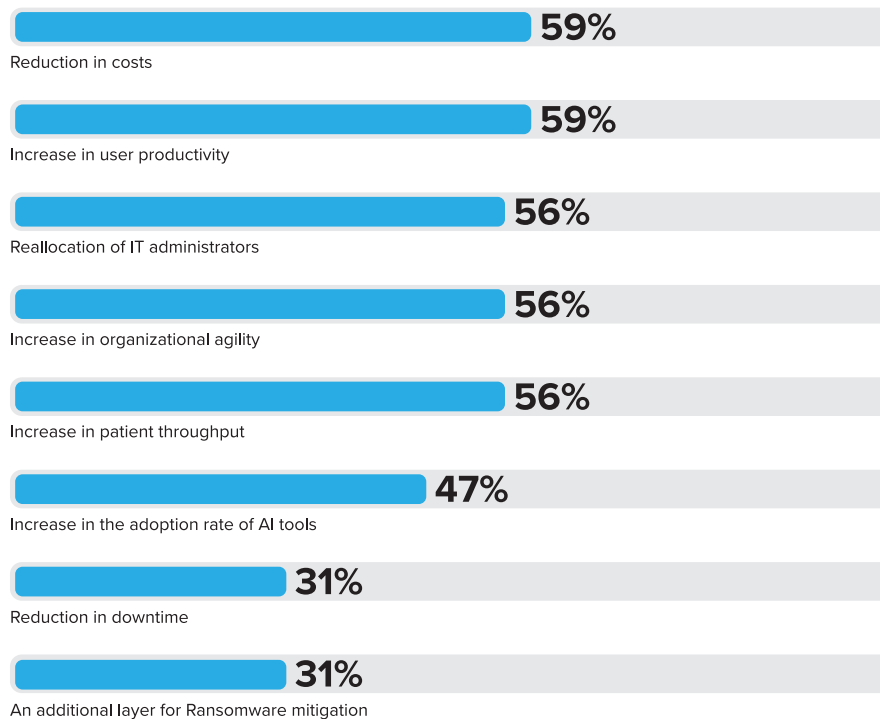
- **Costs of the Edison True PACS solution.** Costs associated with the Edison True PACS

solution investment include ongoing subscription, storage, artificial intelligence, and automation orchestration fees, as well as one-time implementation and training fees.

Forrester modeled a range of projected low-, medium-, and high-impact outcomes based on evaluated risk. This financial analysis projects that the composite organization accrues the following three-year net present value (NPV) for each scenario by enabling the GE Healthcare Edison True PACS solution:

- Projected high impact of a \$4.8 million NPV and projected ROI of 202%.
- Projected medium impact of a \$2.6 million NPV and projected ROI of 109%.
- Projected low impact of a \$1.3M NPV and projected ROI of 56%.

"Which of the following benefits do you believe your organization would experience as a result of migrating to a cloud-based PACS solution? I believe the key benefits my organization would experience would be a/an . . ."



Base: 32 representatives with experience using on-premises PACS solutions at their organizations
 Source: A commissioned study conducted by Forrester Consulting on behalf of GE Healthcare



PROI
56% to 202%



PROJECTED BENEFITS
PV
\$3.7M to \$7.1M

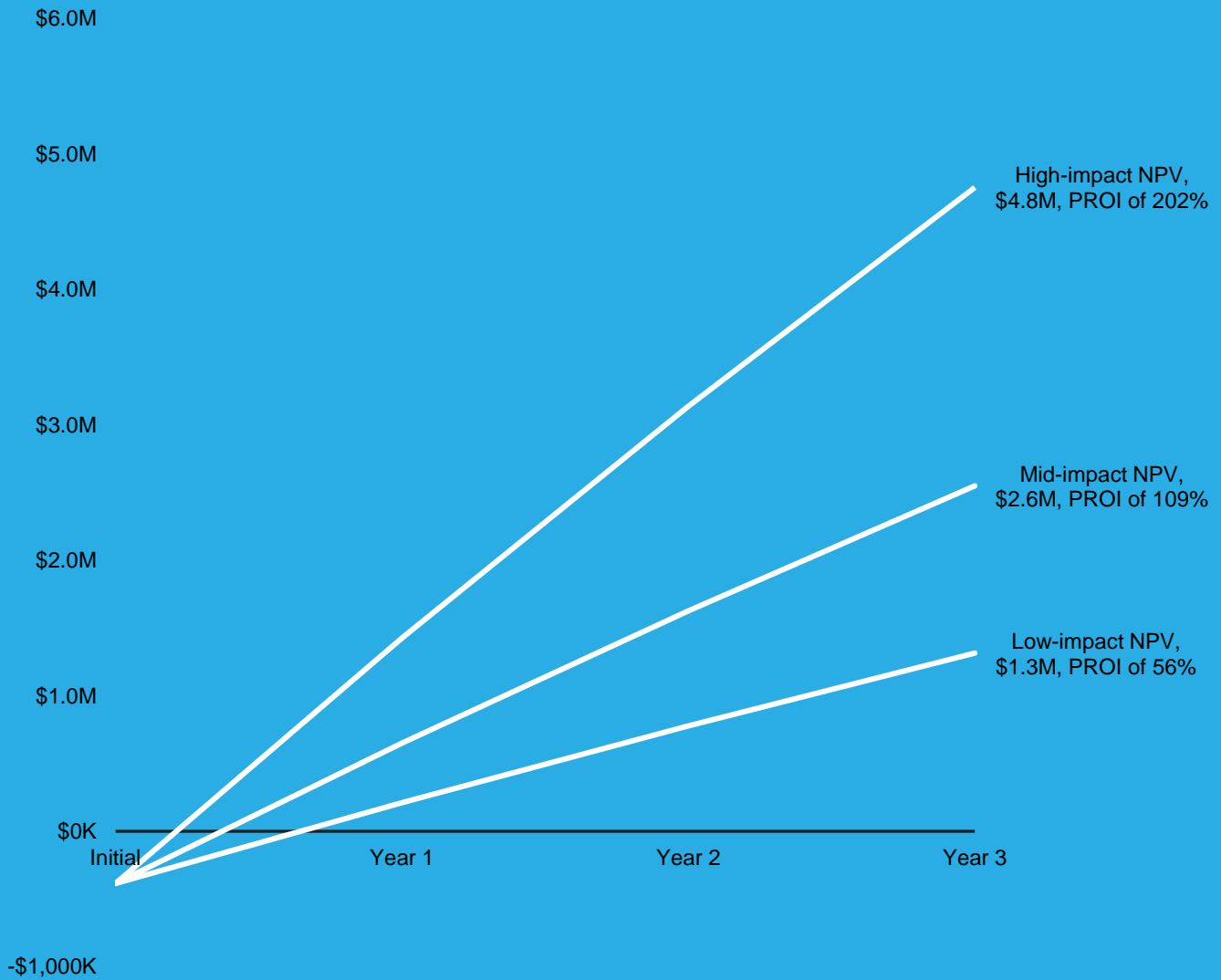


PROJECTED NPV
\$1.3M to \$4.8M



TOTAL COSTS PV
\$2.3M

Three-Year Projected Financial Analysis For The Composite Organization



NEW TECH TEI FRAMEWORK AND METHODOLOGY

From the information provided in the interviews, Forrester constructed a New Technology: Projected Total Economic Impact™ (New Tech TEI) framework for those organizations considering an investment in the Edison True PACS solution.

The objective of the framework is to identify the potential cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the projected impact that the Edison True PACS solution can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by GE Healthcare 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 the Edison True PACS solution.

GE Healthcare 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.

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

Forrester fielded the double-blind survey using a third-party survey partner.



DUE DILIGENCE

Interviewed GE Healthcare stakeholders and Forrester analysts to gather data relative to the Edison True PACS solution.



EARLY-IMPLEMENTATION INTERVIEWS AND SURVEY

Interviewed three representatives and surveyed 32 representatives at organizations investigating the Edison True PACS solution in a pilot or beta stage to obtain data with respect to projected costs, benefits, and risks.



COMPOSITE ORGANIZATION

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



PROJECTED FINANCIAL MODEL FRAMEWORK

Constructed a projected financial model representative of the interviews and survey using the New Tech TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewees and survey respondents.



CASE STUDY

Employed four fundamental elements of New Tech TEI in modeling the investment's potential 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 GE Healthcare Edison True PACS solution Customer Journey

■ Drivers leading to a potential Edison True PACS solution investment

Interviews			
Role	Industry	Region	Annual images and radiologists
Manager of imaging technology	Healthcare	North America	135,000 annual images and 10 radiologists
Manager of medical imaging	Healthcare	North America	187,000 annual images and 35 radiologists
VP of radiology	Healthcare	North America	500,000 annual images and 178 radiologists

KEY CHALLENGES

Before potentially investing in the GE Healthcare Edison True PACS solution, the interviewees' and survey respondents' organizations were all utilizing on-premises PACS solutions for their radiology practices.

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

- **High costs of infrastructure maintenance and upgrades.** Interviewees and survey respondents said their organizations struggled with infrastructure maintenance and upgrades for their on-premises PACS. They noted experiencing constant and continuous labor, hardware, and software costs associated with:
 - Server management, upgrades, and patching.
 - Storage growth and evolution.
 - Costs of regular PACS software upgrades.
 - Finding enough talent to maintain on-premises systems and sometimes resorting to expensive consultants to fill short-term gaps.
- **Risk and costs of downtime.** Similarly, interviewees and survey respondents both said

their organizations experienced high risk and costs associated with downtime for their on-premises PACS. They noted having limited availability to maintain uptime. Some had high availability to prevent downtime from upgrades but no disaster recovery solution, while others sometimes experienced outages that impacted the entire hospital.

- **Vendor lifecycle and interoperability management.** Lastly, the interviewees and respondents noted that as on-premises software upgrade cycles evolved, vendors eventually became reluctant to support older versions of their solutions, which sometimes required their organizations to shoulder the costs of upgrading their entire PACS ecosystems. Additionally, organizations struggled to manage vendor interoperability because different vendors would claim to use industry standards, but these standards were not always universal in practice.

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 three interviewees and 92 survey respondents, and it is used to present the aggregate financial analysis in the next section. The composite organization has the following characteristics:

Description of composite. The composite is a large regional healthcare provider with 6,400 total employees. It takes and stores an average of 225,000 annual images with its on-premises PACS system, which is operated and managed by 20 radiologists, two PACS admins, and 5.5 IT FTEs. It has multiple reading locations and supports remote reading for its radiologists.

Deployment characteristics. The composite incurred a number of costs associated with its on-premises PACS solutions, including software-licensing fees, hardware and maintenance fees, on-premises storage costs, security solution costs for its on-premises infrastructure, and additional infrastructure costs such as real estate, utilities, and IT management labor costs. It investigates investing in a cloud-based PACS in order to reduce many of these costs, except those related to virtual machines to run an edge server for buffering and connecting to the cloud-based solution. For its cloud-based Edison True PACS solution deployment, it requires the migration of 300TB worth of historical exam images. It incurs additional storage costs as additional exams are stored in following years.

Key Assumptions

- **6,400 total employees**
- **225,000 annual images**
- **20 radiologists**
- **2 PACS admins**
- **5.5 IT FTEs for on-premises management**

Analysis Of Benefits

■ Quantified benefit data as applied to the composite

Total Projected Benefits					
Benefit	Year 1	Year 2	Year 3	Total	Present Value
Total projected benefits (low)	\$1,443,039	\$1,474,721	\$1,507,987	\$4,425,747	\$3,663,603
Total projected benefits (mid)	\$1,925,831	\$1,971,890	\$2,020,252	\$5,917,974	\$4,898,264
Total projected benefits (high)	\$2,780,372	\$2,859,425	\$2,942,430	\$8,582,226	\$7,101,462

ELIMINATING COST OF ON-PREMISES SOLUTION

Evidence and data. As the interviewees’ and survey respondents’ organizations moved away from their on-premises PACS, they replaced them with GE Healthcare’s cloud-based Edison True PACS solution, which allowed them to save on a significant portion of the technology costs associated with their prior on-premises PACS.

The interviewees and survey respondents said their organizations eliminated the following on-premises PACS technology costs:

- Software licensing.
- Hardware costs and maintenance fees.
- Real estate and utilities costs for on-premises hardware.
- Storage and backup costs.
- On-premises security solution and penetration-testing services costs.
- Upgrade and expansion costs.

For example, a manager of imaging technology shared, “We expect to eliminate all of our costs from our on-premises solution, which includes software, storage, and infrastructure.”

Discussing storage costs specifically, a manager of medical imaging said: “Enterprise grade storage, whether NAS [network-attached storage] or a SAN [storage area network], is super expensive. It’s a huge plus to be able to downsize or repurpose that storage that we had dedicated to PACS.”

For backups, the same interviewee noted: “Disaster recovery was always a challenge. We struggled with our PACS archives, especially offsite and air-gapped backup solutions. We went so far as to reevaluate tape for our long-term archives because we can’t keep everything forever on spinning disk due to cost and complexity.”

Regarding security solutions, a VP of radiology said: “We had to have quite a few different antivirus software solutions loaded on our PACS systems. We also had an annual penetration testing and audit done by an outside firm every year.”

As far as upgrade and expansion costs, the manager of medical imaging said: “If something significant happens or we have to refresh the infrastructure with compute, we have to dig up the capital and pay half a million or a million dollars. Just our latest PACS expansion cost us in excess of about \$200,000.”

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

- The composite organization takes and stores 225,000 images annually.
- The cost of its previous on-premises PACS software amounts to approximately \$1.63 for a total of \$366,750 annually.
- The total cost of on-premises storage, infrastructure (including real estate and utilities), and security solutions cost \$300,000 annually.
- The total annualized cost of upgrading its PACS solution is \$235,000, which includes any technology and labor costs.
- These costs vary by -20% (low) and +20% (high).

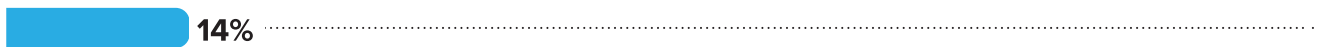
Results. This yields a three-year projected PV (discounted at 10%) ranging from \$1.8 million (low) to \$2.7 million (high).

“We constantly have upgrades that we’re doing to our PACS. And each one of those costs about half a million dollars each year. So, from a monetary perspective, it was a very expensive solution.”

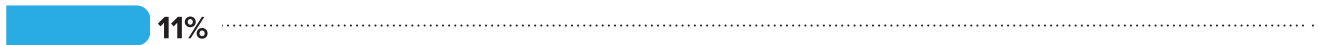
VP of radiology, healthcare

“You indicated that you believe that a cloud-based PACS solution would reduce costs for your organization. Which of the following costs would you expect it to reduce?”

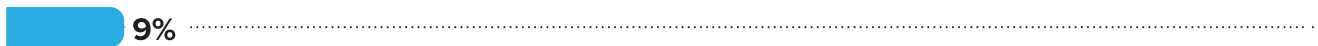
On-premises hardware costs



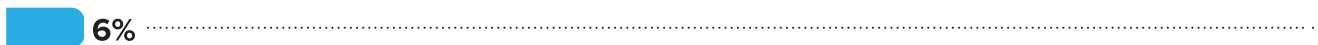
Infrastructure spending (networking equipment, power, cooling, and other data center costs)



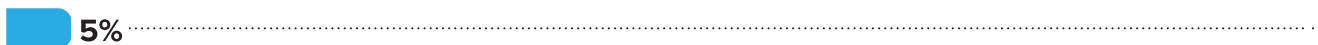
Disaster recovery costs



PACS software licensing costs



Third-party software costs required to manage your PACS solution



Base: 19 representatives with experience using on-premises PACS solutions at their organizations
Source: A commissioned study conducted by Forrester Consulting on behalf of GE Healthcare

Reduced Cost Of On-Premises Solution					
Ref.	Metric	Source	Year 1	Year 2	Year 3
A1	Number of annual images	Composite	225,000	225,000	225,000
A2	Annual cost of software	Survey	\$366,750	\$366,750	\$366,750
A3	Annual cost of storage, infrastructure, and security solutions	Interviews	\$300,000	\$300,000	\$300,000
A4	Annual total cost of upgrades	Survey	\$235,000	\$235,000	\$235,000
A5 _{Low}			-20%	-20%	-20%
A5 _{Mid}	Potential variance in costs	Survey	0%	0%	0%
A5 _{High}			20%	20%	20%
At _{Low}			\$721,400	\$721,400	\$721,400
At _{Mid}	Reduced cost of on-premises solution	$(A2+A3+A4)*(1+A4)$	\$901,750	\$901,750	\$901,750
At _{High}			\$1,082,100	\$1,082,100	\$1,082,100

Reduced cost of prior solution: Summary Table						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
At _{Low}	Reduced cost of prior solution (Low)	\$721,400	\$721,400	\$721,400	\$2,164,200	\$1,794,015
At _{Mid}	Reduced cost of prior solution (Mid)	\$901,750	\$901,750	\$901,750	\$2,705,250	\$2,242,519
At _{High}	Reduced cost of prior solution (High)	\$1,082,100	\$1,082,100	\$1,082,100	\$3,246,300	\$2,691,023

IMPROVED PACS-RELATED OPERATIONS

Evidence and data. Shifting from an on-premises PACS to the cloud-based Edison True PACS solution also enabled the interviewees’ and survey respondents’ organizations to improve their PACS-related operations. Specifically, streamlined file sharing, easier integrations, and the addition of artificial intelligence and automation enabled both radiologists and PACS administrators to become more productive.

Regarding file sharing, the manager of imaging technology shared: “We had a lot of file-sharing solutions that we used to share images with other facilities and partners — maybe a couple thousand different solutions. Because these stakeholders

would have a multitude of solutions of their own, our radiologists and PACS administrators would constantly have to switch tools to effectively share images. With the Edison True PACS solution, we could just share directly in our PACS, leveraging connectors and integrations to various other tools.”

The Edison True PACS solution also enables easier integration with third-party AI solutions, whether these are cloud-based or on-premises. Sharing the expected benefits of integrating AI within a cloud-based PACS, the manager of imaging technology said, “Having automated measurements sent into the PACS system and then through the reporting system automatically is certainly attractive to everyone.” The manager of medical imaging noted, “I’m not sure our

organization is ready for it, but we do get requests from radiologists, and we like to do the latest and greatest stuff instead of just fixing what’s broken.”

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

- The composite has a total of 20 radiologists, each of whom has an average fully burdened annual rate of \$330,000 that grows at 5% annually.
- The composite has a total of two PACS administrators, each of whom has an average fully burdened annual rate of \$85,000 that grows at 5% annually.
- The improvement to PACS team operations ranges from 13% (low) to 38% (high).
- The productivity recapture rate is 50%.

Results. This yields a three-year projected PV (discounted at 10%) ranging from \$1.1 million (low) to \$3.4 million (high).

“We are definitely starting to look at AI as part of our PACS. It’s important not just for radiologists and administrators, but it can also really help our patients.”

VP of radiology, healthcare

Improved PACS-Related Operations					
Ref.	Metric	Source	Year 1	Year 2	Year 3
B1	Number of radiologists	Composite	20	20	20
B2	Fully burdened annual rate per radiologist	Composite	\$330,000	\$346,500	\$363,825
B3	Number of PACS admins	Composite	2	2	2
B4	Fully burdened annual rate per admin	Composite	\$85,000	\$89,250	\$93,713
B5 _{Low}			13%	13%	13%
B5 _{Mid}	Improvement to PACS team operations	Survey	20%	20%	20%
B5 _{High}			38%	38%	38%
B6	Productivity recapture rate	TEI standard	50%	50%	50%
Bt _{Low}			\$440,050	\$462,053	\$485,155
Bt _{Mid}	Improved PACS-related operations	$(B1*B2+B3*B4)*D$ $5*B6$	\$677,000	\$710,850	\$746,393
Bt _{High}			\$1,286,300	\$1,350,615	\$1,418,146

Improved PACS-related operations: Summary Table						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
Bt _{Low}	Improved PACS-related operations (Low)	\$440,050	\$462,053	\$485,155	\$1,387,258	\$1,146,411
Bt _{Mid}	Improved PACS-related operations (Mid)	\$677,000	\$710,850	\$746,393	\$2,134,243	\$1,763,710
Bt _{High}	Improved PACS-related operations (High)	\$1,286,300	\$1,350,615	\$1,418,146	\$4,055,061	\$3,351,048

REDUCED INFRASTRUCTURE MANAGEMENT COSTS

Evidence and data. Shifting their PACS environments from on-premises to the cloud also would enable the interviewees' and survey respondents' organizations the ability to reduce management costs associated with on-premises infrastructure.

For example, the manager of imaging technology said: "We're always stretched thin in terms of managing out on-premises PACS. We're currently hiring two additional people to help out. We would definitely see time savings moving to a cloud-based system."

The manager of medical imaging shared: "Our on-premises infrastructure is so complex that there's definitely some inefficiencies in managing and understanding what goes where and which applications are on which server. It's very challenging to administrate."

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

- The composite previously required 2.5 FTEs at an average fully burdened annual rate of \$160,000 each to manage its PACS-related on-premises infrastructure.
- These resources are reallocated at a rate ranging from 40% (low) to 60% (high).
- Based on survey data, the IT resource reallocation rate is 59%.

Results. This yields a three-year projected PV (discounted at 10%) ranging from \$417,000 (low) to \$625,000 (high).

"We definitely wouldn't need as many technical resources dedicated to our PACS as a cloud PACS would offer support folks as part of the solution."

VP of radiology, healthcare



IT resource reallocation rate

59%

Reduced Infrastructure Management Costs					
Ref.	Metric	Source	Year 1	Year 2	Year 3
C1	Prior cost of IT resources	Survey	\$400,000	\$420,000	\$441,000
C2 _{Low}			40%	40%	40%
C2 _{Mid}	Reallocation rate of IT resources	Survey	50%	50%	50%
C2 _{High}			60%	60%	60%
Ct _{Low}			\$160,000	\$168,000	\$176,400
Ct _{Mid}	Reduced infrastructure management costs	C1*B2	\$200,000	\$210,000	\$220,500
Ct _{High}			\$240,000	\$252,000	\$264,600

Reduced infrastructure management costs: Summary Table						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
Ct _{Low}	Reduced infrastructure management costs (Low)	\$160,000	\$168,000	\$176,400	\$504,400	\$416,829
Ct _{Mid}	Reduced infrastructure management costs (Mid)	\$200,000	\$210,000	\$220,500	\$630,500	\$521,037
Ct _{High}	Reduced infrastructure management costs (High)	\$240,000	\$252,000	\$264,600	\$756,600	\$625,244

IMPROVED SECURITY

Evidence and data. Not only did interviewees and survey respondents note that on-premises security costs would decrease when moving to a cloud PACS, they also estimated that the security for their organizations’ PACS environment would improve. The manager of imaging technology said: “Security is always a concern, especially for an on-premises PACS. We don’t have enough involvement from IT and different departments to implement different things. We’ll often find out we have unpatched software, but we learn about it too late. One of my core interests in a cloud-based PACS is improving this security.”

The VP of radiology shared, “We know that our security officer has a few concerns with our current on-premises PACS, which is another reason to migrate to the cloud. ”

“Security is always a top concern, especially as it impacts patients.”

VP of radiology, healthcare

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

- The composite experiences an average of 3.1 material breaches annually at an average cost of \$387,392. These costs include, but are not limited to:
 - Lost revenues or business due to breach-related downtime.

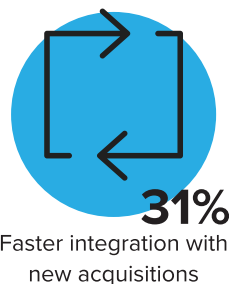
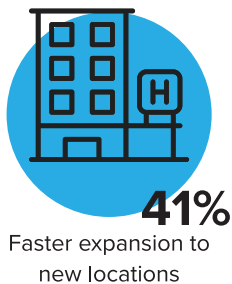
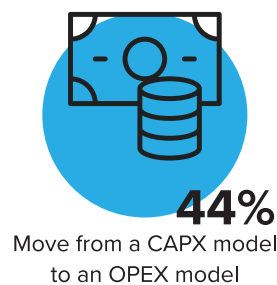
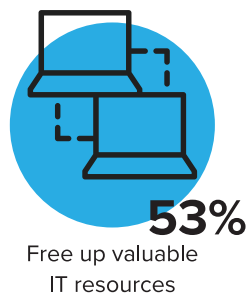
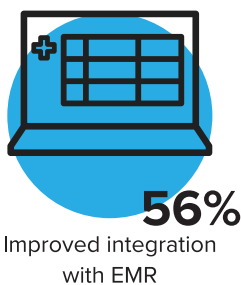
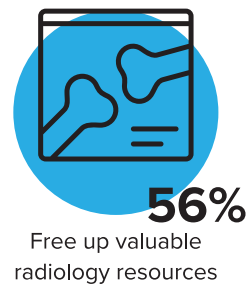
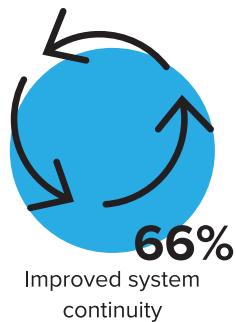
- Cost to rebuild brand equity.
 - Costs to respond and notify affected parties.
 - Regulatory fines.
 - Customer compensation.
 - Additive audit and security compliance costs.
- Ten percent of threats target the composite’s PACS system.
 - The Edison True PACS solution reduces the risk of a material breach from these threats by

between 30% (low) and 50% (high).

- Thirty-three percent of the productivity of the composite’s 6,400 total employees is impacted by a breach, at an average productivity cost of 4 hours per breach.
- The average fully burdened hourly rate for these employees is \$40 each, which increases by 5% annually.

Results. This yields a three-year projected PV (discounted at 10%) ranging from \$171,000 (low) to \$286,000 (high).

“Which of these objectives do you believe would drive your organization to investigate a vendor hosted/public cloud-based PACS solution?”



Base: 32 representatives with experience using on-premises PACS solutions at their organizations
 Source: A commissioned study conducted by Forrester Consulting on behalf of GE Healthcare

Improved Security						
Ref.	Metric	Source	Year 1	Year 2	Year 3	
D1	Average annual number of material breaches	Forrester data	3.1	3.1	3.1	
D2	Average total internal and external costs of a material breach	Forrester data	\$387,392	\$387,392	\$387,392	
D3	Percentage of threats targeting PACS	Composite	10%	10%	10%	
D4 _{Low}			30%	30%	30%	
D4 _{Mid}	Percentage risk improvement from the Edison True PACS solution		40%	40%	40%	
D4 _{High}			50%	50%	50%	
D5 _{Low}			\$36,027	\$36,027	\$36,027	
D5 _{Mid}	Subtotal: Reduced risk of material breach	$D1 \times D2 \times D3 \times E4$	\$48,037	\$48,037	\$48,037	
D5 _{High}			\$60,046	\$60,046	\$60,046	
D6	Total employees	Composite	6,400	6,400	6,400	
D7	Average percent of employees impacted by material breaches	Forrester data	33%	33%	33%	
D8	Prior downtime hours per breach per employee annually	Forrester data	4	4	4	
D9	Average fully burdened hourly rate per employee	TEI standard	\$40	\$42	\$44	
D10 _{Low}			\$31,427	\$32,998	\$34,648	
D10 _{Mid}	Subtotal: Improved productivity from reduced downtime	$D1 \times D3 \times E4 \times D6 \times D7 \times D8 \times D9$	\$41,902	\$43,997	\$46,197	
D10 _{High}			\$52,378	\$54,996	\$57,746	
Dt _{Low}			\$67,454	\$69,025	\$70,675	
Dt _{Mid}	Improved security	$D5 + D10$	\$89,939	\$92,034	\$94,234	
Dt _{High}			\$112,423	\$115,042	\$117,792	

Improved security: Summary Table						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
Dt _{Low}	Improved security (Low)	\$67,454	\$69,025	\$70,675	\$207,155	\$171,467
Dt _{Mid}	Improved security (Mid)	\$89,939	\$92,034	\$94,234	\$276,206	\$228,623
Dt _{High}	Improved security (High)	\$112,423	\$115,042	\$117,792	\$345,258	\$285,778

REDUCED COST OF DOWNTIME

Evidence and data. Lastly, the interviewees and survey respondents estimated that migrating to a cloud PACS would save their organizations costs associated with on-premises PACS downtime. Such costs included:

- Lost revenues.
- Regulatory fines.
- Internal labor costs associated with troubleshooting downtime events.

The manager of medical imaging shared that their organization's on-premises PACS experienced one downtime event of 2 to 3 hours at least once a month. Some downtime events could last as long as 13 hours. Quarterly upgrades would also lead to some impact from downtime, and these took approximately 4 hours to complete. The manager said: "If there's downtime, we may have to reschedule patients as radiology imaging would be delayed. We don't have a DR [disaster recovery] solution currently, but [we] do have data centers."

The VP of radiology also noted the impact to their organization from downtime, saying, "If we can't see radiographic images, then we can't manage patient care. That is going to impact our bottom line." The manager of imaging technology noted: "Downtime has a lot of impacts. If orders and results aren't flowing and physicians throughout the hospital are looking for reports, they have to fax things around. Radiologists may have to do reads and then have them faxed out. All of this impacts our ability to effectively see patients."

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

- There are 12 downtime events annually.
- Total annual lost revenue from downtime is \$75,000.
- Profit margin is 37%.

- A downtime event requires 5.5 FTEs at a fully burdened hourly rate of \$80 each (increasing at 5% annually) to work for 1 hour to bring systems back online.
- The Edison True PACS solution reduces downtime by between 90% (low) and 99% (high).

Results. This yields a three-year projected PV (discounted at 10%) ranging from \$135,000 (low) to \$148,000 (high).

“A cloud-based PACS could not only save on downtime, but maybe some data center costs as well.”

*Manager of medical imaging,
healthcare*

Reduced Cost Of Downtime						
Ref.	Metric	Source	Year 1	Year 2	Year 3	
E1	Lost revenue from downtime	Survey	\$75,000	\$75,000	\$75,000	
E2	Profit margin	Composite	37%	37%	37%	
E3	Cost of fines from downtime	Survey	\$30,000	\$30,000	\$30,000	
E4	Cost to troubleshoot downtime	Composite	\$2,400	\$2,520	\$2,646	
E5 _{Low}			90%	90%	90%	
E5 _{Mid}	Reduction in downtime from transition to cloud	Assumption	95%	95%	95%	
E5 _{High}			99%	99%	99%	
E _t _{Low}			\$54,135	\$54,243	\$54,356	
E _t _{Mid}	Reduced cost of downtime	(E1*E2+E3+E4)*C5	\$57,143	\$57,257	\$57,376	
E _t _{High}			\$59,549	\$59,667	\$59,792	

Reduced cost of downtime: Summary Table						
Ref.	Benefit	Year 1	Year 2	Year 3	Total	Present Value
E _t _{Low}	Reduced cost of downtime (Low)	\$54,135	\$54,243	\$54,356	\$162,734	\$134,881
E _t _{Mid}	Reduced cost of downtime (Mid)	\$57,143	\$57,257	\$57,376	\$171,775	\$142,375
E _t _{High}	Reduced cost of downtime (High)	\$59,549	\$59,667	\$59,792	\$179,008	\$148,369

UNQUANTIFIED BENEFITS

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

- Improved ability to meet care demands.** Interviewees and survey respondents estimated that a cloud-based PACS would improve radiologist productivity and PACS downtime, which would improve their organizations’ abilities to meet care demands. For example, the VP of radiology said: “Downtime hurts operations, but more importantly, it impacts our ability to see and care for patients. If we can’t see 10 chest X-rays, then 10 patients can’t be treated.”
- Shifting capex to opex.** The interviewees noted that a cloud-based PACS would enable their organizations to shift costs from capex to opex

models, providing more predictability. The manager of medical imaging said: “Digging up the capital for expansions, upgrades, and refreshes is difficult even when planned for. Having the visibility and predictability of a cloud-based PACS’ billing would mean we wouldn’t have to worry about over- or under-planning as much.”

- Improved partner and patient experience.** Interviewees said a cloud-based PACS could even improve partner and patient experiences. The manager of medical imaging said: “A cloud-hosted PACS would allow us to share medical records with patients and partners. We want to currently, but because of the IP addresses of those stakeholders, we would have to make security sacrifices in order to do so. The inability

to securely share these records has been a huge driver of dissatisfaction for patients and referring providers.”

- **Reduced risk of accreditation loss.** Extended downtime can impact hospital diversion times, which can negatively impact accreditation. A cloud-based PACS could reduce the risk of losing such accreditation by improving system uptime. The manager of medical imaging stated: “Sometimes our PACS downtime leads to diverts. Depending on how long our divert times are, that can affect our ACS accreditation or our trauma accreditation.”

FLEXIBILITY

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

- **Improved adoption of AI.** The interviewees noted that shifting from an on-premises solution to a cloud-based solution like the Edison True PACS solution would make it easier for their organizations to adopt artificial intelligence as part of their imaging-based healthcare practices. Where on-premises systems require IT and PACS teams to research, implement, and train on AI solutions, the Edison True PACS solution can integrate cloud-based AI into its cloud-based system on the back end, without any need for procurement or implementation on the provider’s part. The VP of radiology said, “Adopting a cloud-based PACS would help us apply AI in the short term rather than in the long term.” Survey respondents said the Edison True PACS solution increased their adoption of AI by 11 points.
- **Improved agility to scale and add or subtract add-on technologies.** The interviewees also shared that a cloud-based PACS would provide additional organizational flexibility related to easier scaling up and down of the PACS as well

as easier integration of additional technologies into their organizations’ healthcare imaging practices compared to on-premises solutions. The manager of medical imaging said: “For us, cost savings are not the main driver. Instead, it’s the agility, the flexibility, the quick addition of resources as needed, [and] growth. [It’s] all of those things.”

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



Increased adoption of AI
+11 points

Analysis Of Costs

■ Quantified cost data as applied to the composite

Total Costs							
Ref.	Cost	Initial	Year 1	Year 2	Year 3	Total	Present Value
Ftr	Cost of GE Healthcare's Edison True PACS solution	\$385,041	\$785,763	\$789,718	\$792,973	\$2,753,495	\$2,347,803
	Total costs (risk-adjusted)	\$385,041	\$785,763	\$789,718	\$792,973	\$2,753,495	\$2,347,803

COST OF GE HEALTHCARE'S EDISON TRUE PACS SOLUTION

Evidence and data. GE Healthcare's Edison True PACS solution charges subscription fees based on tiers of the total number of annual images taken. Additional subscription fees are applied based on the total cloud data storage required for these images on an up-front and ongoing basis. Optional additional fees apply for the addition of artificial intelligence and automation orchestration (AI/AO) tools associated with the Edison True PACS solution. One-time fees include the cost of GE Healthcare's IT professional services to implement the PACS solution and the optional AI/AO technologies and the cost of training for PACS teams. The VP of radiology shared: "For training, we paid GE Healthcare a one-time fee, and we can train as many people as we want. So, it's very cost-effective."

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

- The annual costs of licensing is \$513,000, which includes:
 - Hosting and subscription costs for 225,000 annual exams.
 - Four cloud edge devices at \$6,000 each.
- There are additional storage costs of \$127,658 in Year 1, \$131,613 in Year 2, and \$134,868 in Year 3 to account for the 300TB of historical

exams migrated from the prior on-premises solution and the storage of and additional 225,000 images each year.

- The annual costs of the Edison True PACS solution's artificial intelligence features are \$145,105 annually. These include annual subscription licensing costs for two high-volume (CT and X-ray) AI imaging applications. Actual costs will be dependent on the number and type of AI applications utilized as well as the actual exam volume processed by the respective AI applications.
- The composite pays an up-front cost of \$338,396 for implementation services, which include project management, installation, integration, web archiving, applications training, and clinical consulting services.
- The composite pays \$46,645 up-front for training.
- The composite already has two virtual machines available to run an edge server for its Edison True PACS solution deployment, therefore it does not incur costs related to these VMs, such as machine, OS, and SQL licensing, or labor costs to maintain these VMs.

Risks. The costs of GE Healthcare Edison True PACS solution may vary with:

- The number of annual images taken and stored.

- The use of AI features, GE Healthcare’s implementation services, or training services.

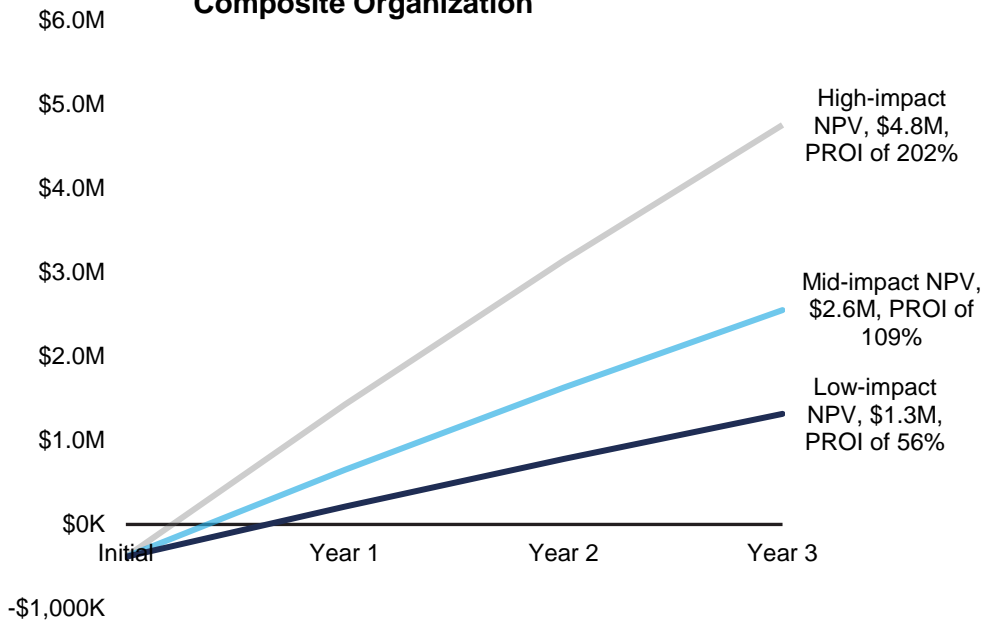
Results. Because GE Healthcare provided the cost for the composite organization, Forrester has not adjusted this cost for risk, yielding a three-year, total PV (discounted at 10%) of \$2.3 million.

Cost Of GE Healthcare’s Edison True PACS solution						
Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
F1	Cost of PACS software licensing	GE Healthcare	\$0	\$513,000	\$513,000	\$513,000
F2	Cost of storage	GE Healthcare	\$0	\$127,658	\$131,613	\$134,868
F3	Cost of AI features	GE Healthcare	\$0	\$145,105	\$145,105	\$145,105
F4	Cost of implementation services	GE Healthcare	\$338,396	\$0	\$0	\$0
F5	Cost of training	GE Healthcare	\$46,645	\$0	\$0	\$0
Ft	Cost of GE Healthcare’s Edison True PACS solution	F1+F2+F3+F4+F5	\$563,533	\$933,789	\$942,006	\$950,224
	Risk adjustment	0%				
Ftr	Cost of GE Healthcare’s Edison True PACS solution (risk-adjusted)		\$385,041	\$785,763	\$789,718	\$792,973
Three-year total: \$2,753,495			Three-year present value: \$2,347,803			

Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Three-Year Projected Financial Analysis For The Composite Organization



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

These risk-adjusted PROI and projected NPV 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	(\$385,041)	(\$785,763)	(\$789,718)	(\$792,973)	(\$2,753,495)	(\$2,347,803)
Total benefits (low)	\$0	\$1,443,039	\$1,474,721	\$1,507,987	\$4,425,747	\$3,663,603
Total benefits (mid)	\$0	\$1,925,831	\$1,971,890	\$2,020,252	\$5,917,974	\$4,898,264
Total benefits (high)	\$0	\$2,780,372	\$2,859,425	\$2,942,430	\$8,582,226	\$7,101,462
PROI (low)						56%
PROI (mid)						109%
PROI (high)						202%

Appendix A: New Technology: Projected Total Economic Impact

New Technology: Projected Total Economic Impact (New Tech TEI) is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value of their products and services to clients. The New Tech TEI methodology helps companies demonstrate and justify the projected tangible value of IT initiatives to senior management and key business stakeholders.

TOTAL ECONOMIC IMPACT APPROACH

Projected Benefits represent the projected value to be delivered to the business by the product. The New Tech TEI methodology places equal weight on the measure of projected benefits and the measure of projected costs, allowing for a full examination of the effect of the technology on the entire organization.

Projected Costs consider all expenses necessary to deliver the proposed value of the product. The projected cost category within New Tech TEI captures incremental ongoing costs over the existing environment that are 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.



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