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The Total Economic Impact™ Of Keysight Eggplant Test Automation Software

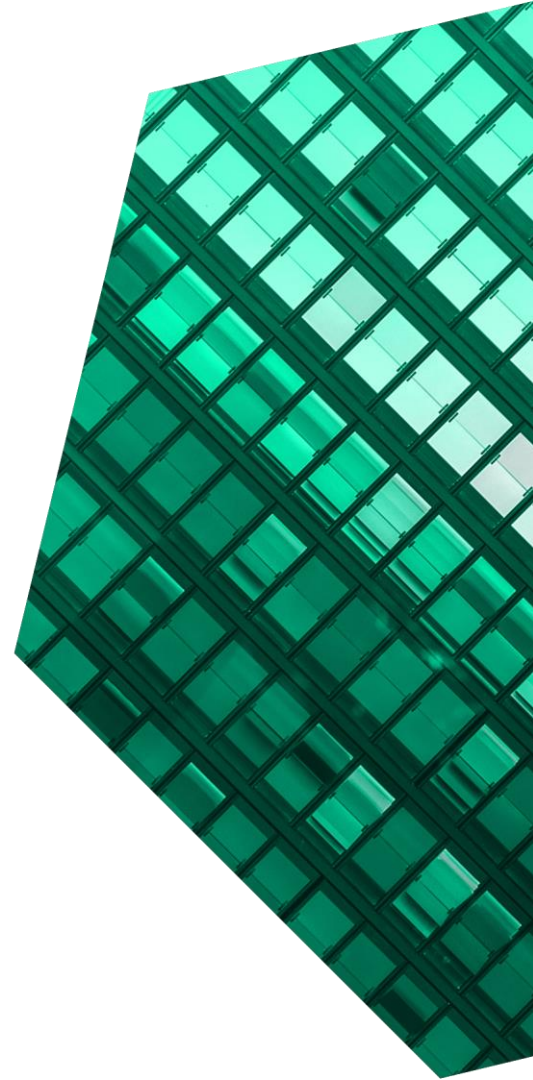
Cost Savings And Business Benefits
Enabled By Eggplant Test

SEPTEMBER 2023

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Executive Summary

Teams responsible for the quality of digital applications and workflows face increasing pressure as the frequency of cloud upgrades and releases increases. Eggplant Test automates the testing of end-to-end user journeys, which supports the need for increased technology iteration, reduces the number of bugs, improves the productivity of application and workflow users, as well as testers. The quality of external applications are also enhanced, resulting in better customer experiences (CX).

Keysight's [Eggplant Test](#) is a continuous testing automation tool that combines linear directed test automation with automated exploratory testing via a model-based approach. It enables teams working to ensure high-quality digital experiences to scale their testing and therefore also supports a higher frequency of iterations and releases.

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

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed two representatives with experience using Keysight's Eggplant automation platform. For the purposes of this study, Forrester aggregated the interviewees' experiences and combined the results into a single [composite organization](#) that is a services organization

80% reduction in bugs released into the field



KEY STATISTICS



Return on investment (ROI)

162%



Net present value (NPV)

\$4.69M

with 15,000 employees and billions of dollars in revenue.

Prior to using Eggplant Test, these interviewees noted how their organizations were struggling to cover the increasing demands of application testing. It was neither viable nor cost-efficient to add more manual testers, and their existing legacy tools were not sufficiently adopted or did not provide the coverage to capture many bugs and defects.

After the investment in Eggplant Test, the interviewees were able to increase the scale of testing significantly. Key results from the investment include improved productivity of application users, reduced bug remediation effort and manual tester efficiencies.

KEY FINDINGS

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

- **Improved application user productivity amounting to \$4.2 million.** After the investment in Eggplant, there are fewer defects and issues with applications. The number of releases increased, enabling more new capabilities, fixes, and functionality to be built into them. As a result, the productivity of those using applications increases. It is assumed that this is equivalent to 2 hours of annual time savings per user.
- **Cost savings from avoided remediations of \$2.5 million.** The number of bugs released into the post-production environment is reduced by 80%. This helps application developers avoid a considerable amount of bug remediation time.
- **Increased manual tester productivity amounting to \$737,000.** Manual testers can significantly increase their productivity, typically by 30% to 40%. Execution programs can complete test cases in a shorter amount of time, and they also function 24 hours a day.
- **Avoided alternative tool costs of \$168,000.** The decommissioning of prior tools that were ineffective, eliminated existing license costs.

simultaneously improves CX. Some of this impact is captured in the application user productivity benefit as interviewees were unable to estimate the indirect impact on customer metrics such as loyalty, conversion, and order value.

- **Improved employee experience (EX).** Testers and others in quality control and application development no longer need to undertake repetitive and uninteresting tasks. Improved EX can drive improvements in related metrics such as higher productivity, reduced absenteeism, and increased retention.

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

- **Licensing fees amounting to \$784,000.** Eggplant Test pricing is structured around the number of execution and development licenses.
- **Planning and implementation costs amounting to \$1.6 million.** This includes the preparation of the applications environments and end-to-end user journeys, as well as the scripting of test cases.
- **Maintenance and incremental hardware costs of \$521,000.** This covers the additional servers needed to run the execution programs and time needed for maintaining test cases.

The representative interviews and financial analysis found that a composite organization experiences benefits of \$7.58 million over three years versus costs of \$2.89 million, adding up to a net present value (NPV) of \$4.69 million and an ROI of 162%.

“Eggplant has helped us provide a level of quality that we'd never be able to achieve manually.”

Chief data officer (CDO), financial services

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

- **Improved CX.** Eggplant is used for many customer-facing applications and end-to-end user journeys. Improving their quality and capabilities



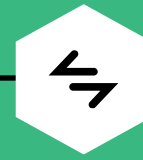
ROI
162%



BENEFITS PV
\$7.58M



NPV
\$4.69M



PAYBACK
9 months

Benefits (Three-Year)

Improved application user productivity

\$4.2M

Cost savings from avoided remediation

\$2.5M

Increased manual tester productivity

\$737.4K

Avoided alternative tool cost

\$167.9K

“We catch bugs earlier in the cycle so that we don't have to catch them in the final QA. Thus, the number of defects that remain in the system by the time it gets to actual people is much, much smaller.”

— CDO, financial services

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 Eggplant Test.

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 Automation Platform can have on an organization.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Keysight 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 Automation Platform.

Keysight 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.

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



DUE DILIGENCE

Interviewed Keysight stakeholders and Forrester analysts to gather data relative to Automation Platform.



INTERVIEWS

Interviewed two representatives at organizations using Eggplant Test 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 interviewees.



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 Eggplant Test Automation Customer Journey

■ Drivers leading to the Eggplant Test investment

Interviews			
Role	Industry	Region	Number of employees
IT manager	Retail	North America	270,000
Chief development officer (CDO)	Financial services	North America	2,300

KEY CHALLENGES

The interviewees shared that their quality assurance and testing teams faced growing pressure. The need to iterate faster required increasingly more testing time, while budgets were also strained.

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

- **Pressure to increase the number of releases.** As more applications sit in the cloud and enterprises depend more on digital technologies, they are improved and upgraded more frequently. However, more testing is required in order to keep up with more releases. Not only was the option of adding more human testing resources not possible because of limits to the budgets, but it was also not always viable as human testers cannot work fast or long enough.

“Management were looking for a couple of things: 1) reducing the cost on how we are spending, and 2) how can we faster turn these releases into production.”

IT manager, retail

- **Difficulties in maintaining and improving application and workflow quality.** Interviewees shared that they struggled to maintain the level of testing because of the increasing number of releases. The CDO in a financial services firm said, “We had a lot of times when it was just too much, and we had to skip some releases.” If bugs and defects get through to post-production environments, it impacts both external and internal applications users, and it also takes more time and effort to fix them compared to in a preproduction environment.

“The reality is a lot of what we're doing now, we had no way of doing before. It's not a question of we can do it faster now. It's like, we couldn't even have done it before.”

CDO, financial services

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

Description of composite. A large, global, multibillion dollar enterprise in the services industry with a total of 15,000 employees. It has 10 key applications which require testing when they are updated and prior to being released to ensure high quality and bug detection and elimination. As more applications move to the cloud and are updated more regularly, the testing team faces mounting pressure.

Deployment characteristics. It has 12 manual testers covering these applications, but they were no longer able to test across all releases. In the initial period, all 10 application environments were prepared for automation testing. In the same period, there is an average of 150 end-to-end user journeys within each application that need to be tested, and scripts were written for 85% of them. For each end-to-end user journey, there is an average of 10 test cases. Therefore, 1,275 test cases were prepared initially, which increases to 1,350 at the end of Year 1 (i.e., equivalent to 90% of applications and end-to-end user journeys), and 1,425 in Year 2 (i.e., equivalent to 95% of applications and end-to-end user journeys).

Furthermore, the number of releases increased from five prior to the investment, and this increases to 20 in Year 1, 24 in Year 2, and 30 in Year 3.

Key Assumptions

- **Global, multibillion dollar enterprise**
- **15,000 employees**
- **12 manual testers**
- **10 applications**

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	Improved application user productivity	\$1,606,500	\$1,701,000	\$1,795,500	\$5,103,000	\$4,215,225
Btr	Cost savings from avoided remediation	\$765,000	\$972,000	\$1,282,500	\$3,019,500	\$2,462,322
Ctr	Increased manual tester productivity	\$256,500	\$299,250	\$342,000	\$897,750	\$737,446
Dtr	Avoided alternative tool costs	\$67,500	\$67,500	\$67,500	\$202,500	\$167,863
	Total benefits (risk-adjusted)	\$2,695,500	\$3,039,750	\$3,487,500	\$9,222,750	\$7,582,856

IMPROVED APPLICATION USER PRODUCTIVITY

Evidence and data. The largest benefit the identified by interviewees was improved application quality. This was attributed to the significant reduction in the number of bugs and defects, and the significant increase in the number of releases so new features, functions, and capabilities could be added.

- The CDO in financial services shared: “We catch bugs earlier in the cycle so that we don't have to catch them in the final QA. Thus, the number of defects that remain in the system by the time it gets to actual people is much, much smaller.”
- Both interviewees emphasized how Keysight Eggplant improved the quality of applications.
- The CDO in financial services also said that they were now able to increase the number of releases they perform: “We were struggling to complete our tests every 4 weeks of the release cycle. Now we are confidently able to do that every 2 weeks.”

Modeling and assumptions. The impact of this benefit has been quantified by estimating the time savings enabled by the improved quality of the applications employees use. These quality

improvements also pertain to customer-facing applications, but for simplicity and due to the difficulty for interviewees in monitoring such impacts, the customer impact has been incorporated into this one benefit.

“The quality is definitely being improved when we run more executions.”

IT manager, retail

- The composite can automate the testing of 8.5 applications in the first year, growing to 9 in Year 2 and 9.5 in Year 3.
- On average, every application is used by a third of employees.
- For each application covered, it is assumed that an average user saves 2 hours each year as there are fewer bugs and because improvements and new features that otherwise would not have been added can now be included.

- The average employee has a fully loaded salary of \$75,000, equivalent to \$42 on an hourly basis.

Risks. It is possible that the impact of this benefit could be lower if the productivity impact, average salary level, or the average number of users per application were lower.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of \$4.2 million.

Improved Application User Productivity					
Ref.	Metric	Source	Year 1	Year 2	Year 3
A1	Total number of applications covered by Eggplant	Composite	8.5	9.0	9.5
A2	Average number of users per application	Assumption	5,000	5,000	5,000
A3	Productivity benefit per application per user (hours)	TEI standard	2.0	2.0	2.0
A4	Total number of hours saved	A1*A2*A3	85,000	90,000	95,000
A5	Average hourly user salary rate	Composite	\$42	\$42	\$42
A6	Productivity conversion rate	TEI standard	50%	50%	50%
At	Improved application user productivity	A4*A5*A6	\$1,785,000	\$1,890,000	\$1,995,000
	Risk adjustment	↓10%			
Atr	Improved application user productivity (risk-adjusted)		\$1,606,500	\$1,701,000	\$1,795,500
Three-year total: \$5,103,500			Three-year present value: \$4,215,225		

COST SAVINGS FROM AVOIDED REMEDIATION

Evidence and data. The avoidance of remediation on bugs and defects is an important benefit. Interviewees shared that they were able to cover much more with Eggplant in terms of testing, which helped them catch bugs and defects earlier, allowing them to significantly reduce the number of bugs that reach post-production.

- The CDO in financial services said, “We know that the vast majority of bugs have already probably been got caught by the exploratory automation.”

Modeling and assumptions. To quantify this benefit, the following assumptions were made:

“In fact, we’ve seen a drop in the bugs delivered into the field — it’s probably 20% of what it used to be.”

CDO, financial services

- There are a total of 150 end-to-end user journeys per application, although this will vary between applications.
- For each end-to-end user journey, there is a baseline of two bugs per release.

- The average bug-fixing time is 15 minutes. The time savings in bug remediation are particularly important in post-production environments, where it is more time consuming and costly compared to preproduction.
- The number of bugs is reduced by 80%.
- The fully loaded salary of a developer is \$150,000.

Risks. The remediation time avoided could be lower for an enterprise like the composite if:

- The baseline number of bugs both pre- and post-production was lower.
- The bug fix-time both pre- and post-production was already lower prior to the Eggplant investment.
- The developer salary rates were lower.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of \$2.5 million.

Cost Savings From Avoided Remediation					
Ref.	Metric	Source	Year 1	Year 2	Year 3
B1	Number of applications covered	Composite	8.5	9.0	9.5
B2	Number of end-to-end user journeys covered by Eggplant	B1*150	1,275	1,350	1,425
B3	Number of releases	Composite	20	24	30
B4	Baseline number of bugs per end-to-end user journey per release	Assumption	2	2	2
B5	Percentage of bugs avoided	Interviews	80%	80%	80%
B6	Reduction in number of bugs	B2*B3*B4*B5	40,800	51,840	68,400
B7	Average end-to-end user journey bug-fix time (hours)	Assumption	0.25	0.25	0.25
B8	Total amount of time saved in fixing bugs (hours)	B6*B7	10,200	12,960	17,100
B9	Hourly salary rate of application developers	TEI standard	\$83	\$83	\$83
Bt	Cost savings from avoided remediation	B8*B9	\$850,000	\$1,080,000	\$1,425,000
	Risk adjustment	↓10%			
Btr	Cost savings from avoided remediation (risk-adjusted)		\$765,000	\$972,000	\$1,282,500
Three-year total: \$3,019,500			Three-year present value: \$2,462,322		

INCREASED MANUAL TESTER PRODUCTIVITY

Evidence and data. Both interviewees shared that manual tester time was freed up following the implementation of Eggplant. The extent of this benefit depends on how much additional testing could and

should be done versus the cost reductions that could be an alternative priority.

- The IT manager in retail shared, “What previously would have taken 3 weeks, [can now be completed] in less than a week.”

- They reinforced: “On average, manual testing took 20 minutes per test case. This is only 12 minutes through automation, [enabling] a 40% reduction.”

Modeling and assumptions. The following assumptions were made to quantify this benefit:

- The composite is assumed to have 12 manual testers.
- The number of releases increases to 20 in Year 1, 24 in Year 2, and 30 in Year 3. Other organizations can choose to increase the manual tester time savings, but not increase the frequency of releases as much.
- The effort of a manual tester reduces by 30% in Year 1, 35% in Year 2, and 40% in Year 3.
- The average fully loaded salary of a manual tester is \$100,000.
- A 75% productivity conversion rate is applied, given that not all time freed up is necessarily returned to manual testing tasks.

“The equivalent of 500 manual hours now was perhaps 60 previously, if we were lucky.”

CDO, financial services

Risks. It is possible that the impact of this benefit could be lower in an organization like the composite if:

- The manual testers were already very efficient and productive.
- Manual tester salaries were lower.
- The productivity capture rate was lower. Note that the manual tester productivity needs to be balanced with the number of releases.

Results. To account for this risk, Forrester adjusted this benefit downward by 5%, yielding a three-year, risk-adjusted total PV of \$737,000.

Increased Manual Tester Productivity					
Ref.	Metric	Source	Year 1	Year 2	Year 3
C1	Baseline number of manual testers	Composite	12	12	12
C2	Reduction in required manual tester effort	Composite	30%	35%	40%
C3	Reduced manual tester effort required	C1*C2	3.6	4.2	4.8
C4	Fully loaded manual tester salary	\$100,000	\$100,000	\$100,000	\$100,000
C5	Productivity capture rate	TEI standard	75%	75%	75%
Ct	Increased manual tester productivity	C3*C4*C5	\$270,000	\$315,000	\$360,000
	Risk adjustment	↓5%			
Ctr	Increased manual tester productivity (risk-adjusted)		\$256,500	\$299,250	\$342,000
Three-year total: \$897,750			Three-year present value: \$737,446		

ALTERNATIVE TOOL COST AVOIDANCE

Evidence and data. Both interviewees mentioned that they were using other tools prior to investing into Keysight Eggplant, but they were not effective.

- The IT Manager in retail said, “The previous tool was not widely used because it did not have the capabilities we needed.”
- The CDO in financial services echoed, “The previous tools didn’t cover nearly enough, and that would basically allow more defects to sneak in, which we would then ultimately catch later on.”

Modeling and assumptions. The following assumptions were made to quantify this benefit:

- It is assumed that the composite was using a single tool previously, which it was able to fully decommission.
- The annual cost of the legacy tool is \$75,000.

Risks. It is possible that a tool of lower cost was used previously by an enterprise like the composite.

Results. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of \$112,000.

Alternative Tool Cost Avoidance					
Ref.	Metric	Source	Year 1	Year 2	Year 3
D1	Licensing cost of alternative tool	Composite	\$75,000	\$75,000	\$75,000
Dt	Alternative tool cost avoidance	D1	\$75,000	\$75,000	\$75,000
	Risk adjustment	↓10%			
Dtr	Alternative tool cost avoidance (risk-adjusted)		\$67,500	\$67,500	\$67,500
Three-year total: \$202,500			Three-year present value: \$167,863		

UNQUANTIFIED BENEFITS

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

- **Improved CX.** Some of the applications and workflows for which Eggplant was used were customer facing. As release cycles increase and quality control coverage improves, CX also improved — due to fewer bugs and issues in the applications, and also because new features and functions could be added sooner. Customer-related benefits have been captured in the first benefit (i.e., improved productivity of application users) but in this case, the users are the customers, and the benefits would have been

“The manual testers can be more productive rather than sitting and running these test cases. Their work is more interesting. It’s important.”

IT manager, retail

customer metrics such as higher conversion, improved loyalty, and increased spend. However, it was not possible for the interviewees to quantify these metrics.

- **Improved EX.** The automation of manual testing processes has a direct positive impact on the quality control and testing team. These tasks are often very repetitive and uninteresting — reducing them improves the experience of employees working on them. This can lead to improvements in related metrics such as higher productivity, reduced absenteeism, and increased retention.

FLEXIBILITY

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

- **Multiple workflows supported.** One of the benefits highlighted by the interviewees was the flexibility of the Eggplant platform, which accommodates workflows where scanners, self-service kiosks, and cash registers and other hardware need to be accommodated.

“The previous system could not automate anything related to the scanner or the embed interactions. The exploratory execution capability of Eggplant was really attractive.”

IT manager, retail

Analysis Of Costs

■ Quantified cost data as applied to the composite

Total Costs							
Ref.	Cost	Initial	Year 1	Year 2	Year 3	Total	Present Value
Etr	Licensing fees	\$0	\$294,000	\$315,000	\$341,250	\$950,250	\$783,989
Ftr	Planning and implementation costs	\$1,508,122	\$46,970	\$46,970	\$0	\$1,602,062	\$1,589,640
Gtr	Maintenance and incremental hardware costs	\$0	\$205,905	\$204,750	\$218,505	\$629,160	\$520,567
	Total costs (risk-adjusted)	\$1,508,122	\$546,875	\$566,720	\$559,755	\$3,181,472	\$2,894,196

LICENSING FEES

Evidence and data. Eggplant fees are categorized into development and execution licenses. The license costs adjust depending on the total size of the contract. The interviewees shared that they automated the bulk of the test cases upfront with Eggplant to accelerate this process. However, additional automations were built every year.

Modeling and assumptions. For an organization like the composite:

- The licensing fees come to \$280,000 in Year 1, grows to \$300,000 in Year 2, and further to \$325,000 in Year 3.

- The composite continues to automate additional test cases, requiring more execution licenses year on year.

Risks. Licensing fees could be higher for an organization the size of the composite, given that prices can change over time.

Results. To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year, risk-adjusted total PV (discounted at 10%) of \$784,000.

Licensing Fees							
Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3	
E1	Licensing fees	Composite	\$0	\$280,000	\$300,000	\$325,000	
Et	Licensing fees	E1	\$0	\$280,000	\$300,000	\$325,000	
	Risk adjustment	↑5%					
Etr	Licensing fees (risk-adjusted)		\$0	\$294,000	\$315,000	\$341,250	
Three-year total: \$950,250				Three-year present value: \$783,989			

PLANNING AND IMPLEMENTATION COSTS

Evidence and data. The interviewees shared how they planned and implemented Keysight Eggplant. They prepared the applications' environments before the end-to-end user journeys within each application, then write the scripts for each of the test cases.

Modeling and assumptions. To quantify the costs, it was assumed that:

- There are 10 application environments that need to be prepared. Each environment takes 12 FTEs a total of 12 full days (i.e., 96 hours).
- There is an average of 150 end-to-end user journeys per application, and of those covered by Eggplant, each requires 10 minutes to prepare.
- Each test case takes an average of 1 hour to create and there is an average of 10 test cases per end-to-end user journey.
- The FTEs preparing the application environments, user journeys, and test cases have a fully loaded salary of \$100,000.

Risks. For an organization like the composite, it is possible that the planning and implementation time takes longer, if there is a different mix of applications and/or the end-to-end user journeys are longer or more complicated.

Results. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a three-year, risk-adjusted total PV of \$1.6 million.

Planning And Implementation Costs						
Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
F1	Number of applications	Composite	10	0	0	0
F2	Number of FTEs	Composite	12	0	0	0
F3	Build, deploy and training time across all applications (hours per FTE)	Interviews	96	0	0	0
F4	Total application environment preparation time (hours)	F1*F2*F3	11,520	0	0	0
F5	Total number of user journeys	F1*150	1,500	1,500	1,500	1,500
F6	Portion of user journeys covered by Eggplant	Composite	85%	90%	95%	95%
F7	Number of user journeys covered by Eggplant	F5*F6	1,275	1,350	1,425	1,425
F8	Number of new user journeys covered by Eggplant	F7(Year n)-(Year n-1)	1,275	75	75	0
F9	Hours spent building end-to-end user journey test scripts	F8*(10/60)	213	13	13	0
F10	Number of new test cases	10*F8	12,750	750	750	0
F11	Total time spent preparing test cases	F10	12,750	750	750	0
F12	Total planning, implementation, and maintenance time	F4+F9+F11	24,483	763	763	0
F13	Hourly rate per FTE	TEI standard	\$56	\$56	\$56	\$56
Ft	Planning and implementation costs	F12*F13	\$1,371,020	\$42,700	\$42,700	\$0
	Risk adjustment	↑10%				
Ftr	Planning and implementation costs (risk-adjusted)		\$1,508,122	\$46,970	\$46,970	\$0
Three-year total: \$1,602,062			Three-year present value: \$1,589,640			

MAINTENANCE AND INCREMENTAL HARDWARE COSTS

Evidence and data. There were two ongoing costs that interviewees described: 1) additional servers required to run the robots which also had to be maintained, and 2) the maintenance of the test cases.

Modeling and assumptions.

- For the amount of test cases that were automated, the composite needs eight robots (or execution licenses) in Year 1, another two in Year 2, and another three in Year 3.

- Each robot requires a single server, and each is assumed to cost \$2,000.
- The maintenance of the servers is assumed to be 10% of this hardware cost.
- For the test case upkeep, it is assumed that each requires 15 minutes of maintenance annually.

Risks. There is a small risk that the hardware and maintenance costs could be higher if the server acquisition cost is higher or the average time per test case maintenance is longer.

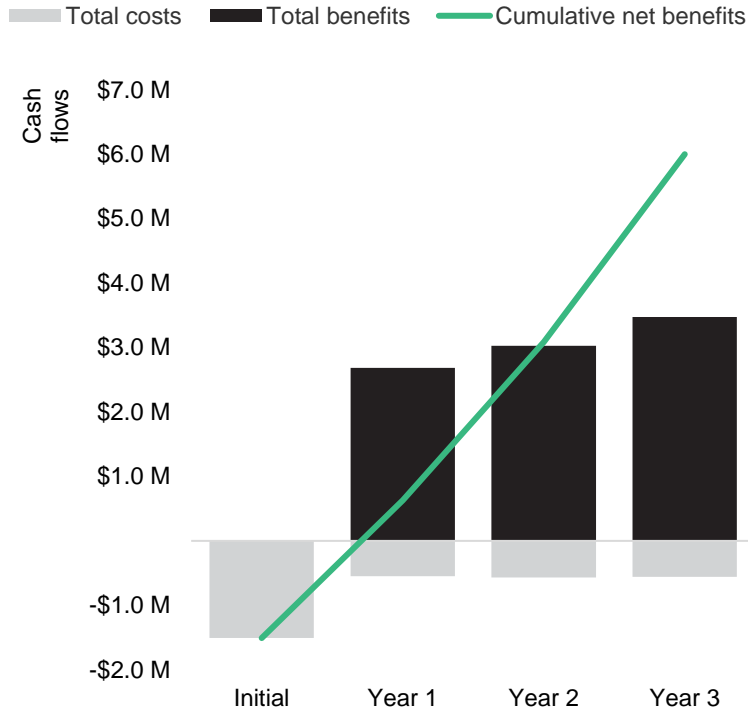
Results. To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year, risk-adjusted total PV of \$521,000.

Maintenance And Incremental Hardware Costs						
Ref.	Metric	Source	Initial	Year 1	Year 2	Year 3
G1	Number of robots	Composite	0	8	10	13
G2	Number of new servers	1 server per robot	0	8	2	3
G3	Server acquisition cost	G2*\$2,000	\$0	\$16,000	\$4,000	\$6,000
G4	Server maintenance costs	10% of cumulative hardware cost	\$0	\$1,600	\$2,000	\$2,600
G5	Subtotal: Incremental hardware costs	G3+G4	\$0	\$17,600	\$6,000	\$8,600
G6	Number of test cases covered by Eggplant	F10 cumulative	0	12,750	13,500	14,250
G7	Total test case maintenance time	G6*15/60	0	3,188	3,375	3,563
G8	FTE hourly rate (based on fully loaded salary of \$100,000)	TEI standard	\$0	\$56	\$56	\$56
G9	Subtotal: Test case maintenance costs	G7*G8	\$0	\$178,500	\$189,000	\$199,500
Gt	Maintenance and incremental hardware costs	G5+G9	\$0	\$196,100	\$195,000	\$208,100
	Risk adjustment	↑5%				
Gtr	Maintenance and incremental hardware costs (risk-adjusted)		\$0	\$205,905	\$204,750	\$218,505
Three-year total: \$629,160			Three-year present value: \$520,567			

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	(\$1,508,122)	(\$546,875)	(\$566,720)	(\$559,755)	(\$3,181,472)	(\$2,894,196)
Total benefits	\$0	\$2,695,500	\$3,039,750	\$3,487,500	\$9,222,750	\$7,582,856
Net benefits	(\$1,508,122)	\$2,148,625	\$2,473,030	\$2,927,745	\$6,041,278	\$4,688,660
ROI						162%
Payback period						9 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: Supplemental Material

Related Forrester Research

[“The 12 Must-Dos For Achieving Continuous Software Testing,”](#) Forrester Research, Inc., June 28, 2023.

Appendix C: 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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