A Forrester Total Economic Impact™ Study Prepared For IBM

The Total Economic Impact™ Of The IBM Rational Solution for Collaborative Lifecycle Management

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FORRESTER®

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scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit www.forrester.com/consulting.

Executive Summary

In March 2013, IBM commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying the IBM Rational solution for Collaborative Lifecycle Management (CLM), which includes Rational Team Concert™, Rational Quality Manager, and Rational Requirements Composer and is built on the IBM Rational® Jazz™ platform. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the IBM Rational solution for CLM for their organizations.

IBM Rational solution for CLM Increases Communication Process Efficiencies And Time Savings

To better understand benefits, costs, and risks associated with the implementation of the IBM Rational solution for CLM built on the Jazz platform, Forrester interviewed four existing IBM customers spanning various industries, organization sizes, and deployment scenarios. Forrester's interviews with four existing customers and subsequent financial analysis found that a composite organization based on insights from the customers we interviewed experienced the risk-adjusted ROI, costs, and benefits shown in Table 1. See Appendix A for a description of the composite organization.

Table 1
Composite Organization's Three-Year Risk-Adjusted ROI[1]

ROI	Payback period	Total benefits (PV)	Total costs (PV)	Net present value
522%	3.0	$1,738,683	($279,390)	$1,459,294

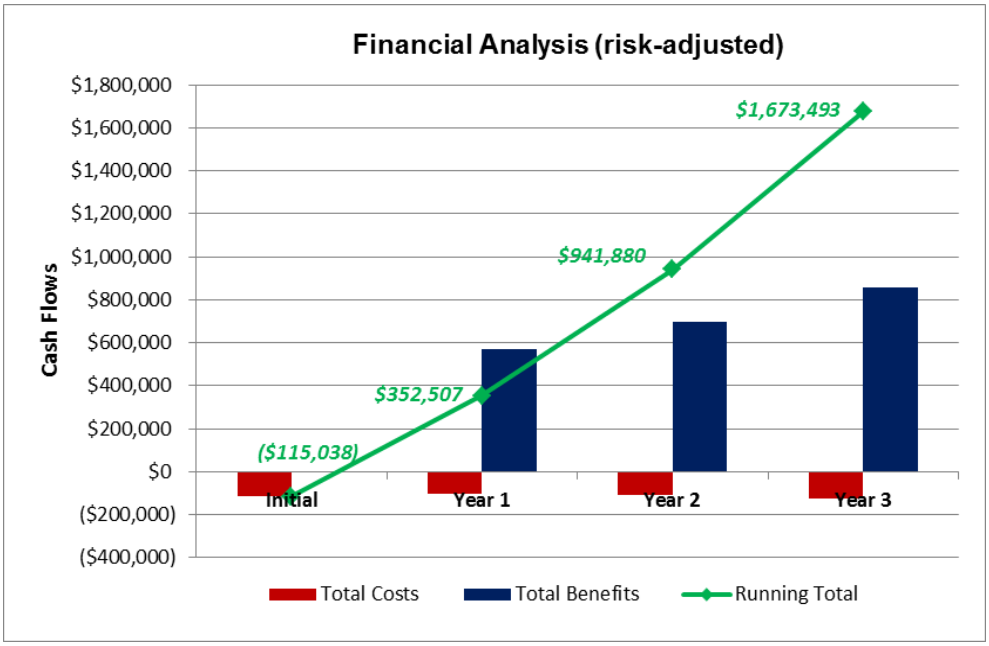
Source: Forrester Research, Inc.

- **Benefits.** The composite organization experienced the following benefits (figures shown are non-risk adjusted benefit totals by category):
    - **Expanded geographic coverage ($1,026,250).** Benefits that resulted from the opening of additional locations, providing coverage across different time zones and lowering labor and infrastructure costs.
    - **Improved team coordination capability ($639,600).** Benefits experienced as team members capture work items and updates, leading to improved traceability and better visibility for all team members.

- **Enhanced project delivery capacity ($282,330).** Benefits that resulted from the ability to run multiple projects in parallel rather than being restricted to a single project tracking model as with legacy systems.
- **Improved development and testing productivity ($151,800).** Benefits that accrued to the organization as capabilities, work items, and additional resources were aggregated and easily findable under one tool.
- **Reduced cost for rework and resolving issues ($72,610).** Benefits experienced as a result of improved traceability, enabling teams to more quickly isolate problems and obtain context for the project history.
- **Enhanced reporting and planning capability ($58,968).** Benefits that accrued from more centralized and easily extractable planning and reporting capability.
- **Eliminated legacy software licensing fees ($105,000)**. Benefits that resulted from eliminating use of one legacy software configuration management software used prior to the IBM Rational solution for CLM.

- **Costs.** The composite organization incurred the following costs for their investment in the IBM Rational solution for CLM (figures shown are non-risk adjusted cost totals by category):
  - **Licensing fees (list price) and subscription and support fees ($131,596).** Costs incurred for licenses reflect an updated license pricing structure for the solution for CLM.
  - **Internal implementation and maintenance costs ($109,392).** Costs for staff monitoring, maintaining, and updating the software, and ensuring it is successfully integrated into the existing team's workflow.
  - **Hardware expenses ($18,930).** Costs for acquiring, setting up, configuring, and maintaining server resources to support the IBM Rational solution for CLM.

Figure 1
Three-Year Risk-Adjusted Cost/Benefit Breakdown



Source: Forrester Research, Inc.

Factors Affecting Benefits And Costs

Table 1 illustrates the risk-adjusted financial results that were achieved by the composite organization. The risk-adjusted values take into account any potential uncertainty or variance that exists in estimating the costs and benefits, which produces more conservative estimates. The following factors may affect the financial results that an organization may experience:

- The development approach used by the organization, and whether new approaches (e.g., Agile) are being implemented in parallel to deploying the solution for CLM. This may impact implementation costs, including internal labor costs to support planning, training requirements, and change management.
- The environment prior to implementing the solution for CLM. An organization that previously used a unified ALM solution may incur lower implementation costs, and is likely to have captured some of the benefits from using a unified ALM solution.
- The scope of the implementation, including the size of the development staff and the number of locations to which the solution is being deployed. Larger organizations can expect both greater costs and greater benefits.

- The number of solutions from the solution for CLM that are implemented and used. The solution for CLM includes Rational Team Concert, Rational Quality Manager, and Rational Requirements Composer. Companies that deploy multiple products are likely to experience incremental benefits.

Disclosures

The reader should be aware of the following:

- The study is commissioned by IBM and delivered by the Forrester Consulting group.
- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in the solution for CLM.
- IBM 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.
- The customer names for the interviews conducted by Forrester were provided by IBM.

TEI Framework And Methodology

Introduction

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ framework for those organizations considering implementing the solution for CLM. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

Approach And Methodology

Forrester took a multistep approach to evaluate the impact that the solution for CLM can have on an organization (see Figure 2). Specifically, we:

- Interviewed IBM marketing/sales/consultants personnel and Forrester analysts to gather data relative to the solution for CLM and the marketplace for these products.
- Interviewed four organizations currently using one or several offerings that comprise the solution for CLM to obtain data with respect to costs, benefits, and associated risks from implementing these solutions.
- Designed a composite organization based on characteristics of the interviewed organizations (see Appendix A).
- Constructed a financial model representative of the interviews using the TEI methodology.

Figure 2
TEI Approach

Source: Forrester Research, Inc.

Forrester employed four fundamental elements of TEI in modeling the IBM Rational solution for CLM:

1. Costs.
2. Benefits to the entire organization.
3. Flexibility.
4. Risk.

Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves the purpose of providing a complete picture of the total economic impact of purchase decisions. Please see Appendix B for additional information on the TEI methodology.

Analysis

Interview Highlights

A total of four interviews were conducted for this study, involving representatives from the following customers using the IBM Rational solution for CLM built on the Jazz platform:

1. **A global producer of climate and energy products.** The company provides a variety of heating, air-conditioning, energy, and automation products across many different countries. It is organized into three separate divisions, one of which is currently using Rational Team Concert (RTC) and Rational Quality Manager (RQM). It has approximately 300 developers, of which about 50 are using the solution for CLM. With the implementation of the solution for CLM, the development group has been able to become more geographically diversified. The company plans to continue expand its development group's geographic footprint in order to take advantage of diversified developer talent across geographies and lower operating costs in emerging locations. The company plans to significantly increase the presence of software in its product portfolio, relying heavily on its globally dispersed development team. They also plan to deploy RTC and RQM to the two other divisions where they are not currently used.

2. **An Australian-based software and hardware testing services firm**. The company provides clients globally with systems and process testing services. It employs over 350 engineers worldwide; the team interviewed for the case study consisted of 25 engineers. This group uses a remote working model and employees telecommute; all of their resources, including Rational Team Concert (RTC) and Rational Quality Manager (RQM), are handled in the cloud. The company has been using the solution for CLM for two years; prior to this, they managed their application lifecycle management through a series of documents and spreadsheets maintained on a shared content and document management platform. However, because of the limited functionality enabled by the legacy platform, they felt there was an opportunity to increase the extent of collaboration among team members, improve overall efficiency, and thus better meet client and project requirements. Due to their virtual workforce, they saw interesting savings from implementing the solution for CLM from an infrastructure point of view.

3. **A privately-held South American pharmacy chain**. This large drugstore chain, with an IT division of around 100 employees, manages over 200 pharmacies across an expansive geographic area. Thirty of the IT staff use the solution for CLM, including Rational Team Concert (RTC), Rational Quality Manager (RQM), and Rational Requirements Composer (RRC). The organization uses RTC to help them manage their compliance needs. This organization started with three small projects in RTC, and now manages over 180 projects using the solution.

4. **A global software and integrations company.** This organization develops software products for the military, intelligence and national security communities, as well as the healthcare and financial services sectors. The company has offices located in seven countries and sells to customers in 47 different countries. Of its 500 employees, fifty percent are developers, with the majority using RTC. They originally implemented RTC two years ago and adopted the product in order to support their Agile development practices.

Reasons For Adopting The IBM Rational Solution For CLM

The organizations we interviewed adopted the solution for CLM built on the Jazz platform in order to:

- **Increase visibility and traceability throughout all aspects of a project.** A strong need for better visibility and traceability was the strongest motivating factor for all customers interviewed. One customer found that previously, there was no visibility into changes, and no ability to trace requirements to specific codes or tests. They found that, with the solution for CLM "we have much better data quality from developers, [and can] actually trace the changes that are made, which leads to an improved quality of the product." Another customer stated that, "Traceability is important – if I ask why something is not working well, now I have a wealth of information about everything that has happened from requirements to production."

- **Better manage development at a global level.** Managing development that takes place globally requires sophisticated collaboration to stay on top of project timelines. Two customers found that they required the ability to interact better with their globally-disbursed teams. They also needed a way to connect with not just the IT side of the house, but to all areas of the company, such as their business partners. As one customer stated "previously, we would have had to send separate communications to each person; [there was] nowhere near as much interchange with people [as we have now]. The process is much more streamlined than before. Everything is smoother."

- **Increase the flexibility of their projects.** One customer noted the importance of flexibility to his company. "A nice benefit that we have achieved is flexibility for the developers to choose how they want to work, and tailor their process – how they collect data and work with it. We start from a shared template and tailor that template as necessary." The same client also noted that the ability to support Agile development is crucial to their success, and that other tools were not flexible enough for Agile development.

- **Increase compliance and the ability to respond quickly to audit situations.** Another client noted that that their industry is heavily regulated, and their previous environment made reacting to compliance needs a burden. They use the solution for CLM in order to consolidate all their documents and allow their different teams to react quickly to auditing needs.

Qualitative Benefits Not Quantified

Several additional benefits were mentioned by clients. Since they are qualitative, we did not include them in the financial analysis of the benefits. However, the reader is urged not to underestimate the importance of these benefits.

- **Increased employee satisfaction resulting from improved visibility and coordination.** Two of the four companies we interviewed spoke in depth about the increased employee satisfaction and team morale brought about by the implementation of the solution for CLM. One client noted, about their developers, "their life is better now; [each person] has visibility into their job, and they are able to really show what they're doing and the reason for doing it. The relationship within the team is better – if someone asks what the goal is, they are able to easily trace it back to requirements. It provides a better way for different team members to talk. Today's business teams and software development team are really able to work together." Another client noted that their developers are happier using the solution for CLM because they can be more efficient and suffer through less rework.

- **Enhanced revenue potential with a quick time to market and reduced downtime.** Another important benefit mentioned by customers is that they were now able to complete projects faster due to better requirements and quality of product, increased quality of planning, and faster, more efficient testing. Due to this, clients reported they were able to both finish individual projects faster, and take on more projects at one time than they could in previous environments. And while not all increased revenues can be tied directly to development efforts, the interviewed customers felt that solution for CLM played a role in this.

Composite Organization

Based on the interviews with the four existing customers provided by IBM, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization that Forrester synthesized from these results represents a multinational manufacturing organization with 10,000 employees which is headquartered in the UK. Software is an increasingly important aspect of the company's product development process as it switches from traditionally manual, basic offerings to more sophisticated products with automated, software-driven components and features. Therefore, the company expects steady growth in its software development groups as they play an increasingly greater role in product development, requiring improved processes for partnering with business and sales stakeholders and increased project delivery capacity and reliability.

The company is divided into different divisions, one of whom is using RTC and RQM. It plans to implement RRC in the future to further expand the solution for CLM functionalities available to the development team. This division's development team includes two project managers, eighteen developers, and two QA engineers, all working out of the headquarters location. In addition, the adoption of the solution for CLM enables the company to expand its geographic footprint by providing improved cross-location coordination tools. The division elects to open a second development site to enable coverage across different time zones and to leverage significant cost savings. The second development site, based out of India, includes one project manager, several developers, and a QA resource. The division is also considering expanding coverage of the development organization to tertiary sites in Asia and Europe.

The composite organization implemented the solution for CLM in two phases. The first phase was a pilot program to ensure the solution met their needs, to set up structure/templates, and to learn how to use the solution. The initial pilot involved one project manager, three developers, and one QA engineer. The second phase included the remainder of the division's software development team, and was rolled out over the next 12 months. The development team takes on twenty to thirty projects per year using the solution for CLM. Phase one included three projects. Note that not all of the products offered by the company are tied to software projects.

Framework Assumptions

Table 2 provides the model assumptions that Forrester used in this analysis.

Table 2
Model Assumptions

Ref.	Metric	Calculation	Value
A1	Working hours per week		40
A2	Weeks per year		52
A3	Working hours per year (M-F, 9-5)		2,080
A4	Project manager salary (fully loaded)		$130,000
A5	Project manager hourly rate	A4/A3	$63
A6	Developer salary (fully loaded)		$110,000
A7	Developer hourly rate	A6/A3	$53
A8	QA engineer salary (fully loaded)		$90,000
A9	QA engineer hourly rate	A8/A3	$43
A10	Business partner salary (fully loaded)		$150,000
A11	Salary savings for offshore staff (compared to UK location)		50-60%

Source: Forrester Research, Inc.

The discount rate used in the PV and NPV calculations is 10% and time horizon used for the financial modeling is three years. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with their respective company's finance department to determine the most appropriate discount rate to use within their own organizations.

Costs

This section describes and lists the costs incurred by the composite organization for implementing the solution for CLM. Estimates are based on findings from interviews with four existing customers and may vary on an implementation-by-implementation basis.

Licensing Fees (List Price) And Subscription & Support Fees

This is the cost (based on list price) to purchase licenses and to renew subscription and support (annually) for two offerings of the solution for CLM used by the composite organization (RTC and RQM). Licensing fees may depend on the number of seats, use of other IBM Rational products, and other enterprise agreements. Different licensing combinations enable different levels of access to the solution. Because of the complexity, readers are encouraged to work with their IBM account manager to understand what the specific license costs would be. Note that this is an updated cost structure, and several of the interviewees incurred licensing costs under a legacy pricing structure.

For the composite organization, during the piloting phase ten free RTC licenses were provided by IBM. Once piloting was successfully completed, the organization then purchased licenses to deploy the solution across the full development group. The organization selects the turnkey CLM license, which provides access to the two solutions used by the organization – RTC and RQM. Subscription and support are renewed annually. The total three-year licensing fees (at list price) and subscription and support fees are $131,596 (PV of $113,079).

Internal Implementation and Ongoing Maintenance Costs

This is the cost of internal staff to implement the solution into the existing environment and support the ongoing maintenance of the solution. The composite organization invests roughly 1,440 hours upfront, plus an additional 208 hours each year for the ongoing maintenance of the solution for CLM. This is supported by three FTEs during implementation and two FTEs afterwards on an ongoing basis. Assuming an hourly rate of $53 per FTE, the total three-year cost is $109,392 (PV of $103,735).

Table 3
Internal Implementation and Ongoing Maintenance Costs– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
C1	Implementation length (weeks)		16			
C2	Number of FTEs supporting implementation		3			
C3	Hours per week per resource for implementation		30			
C4	Hourly cost per FTE (fully loaded)	A7	$53			
C5	Weeks per year			52	52	52
C6	Number of FTEs supporting maintenance			2	2	2
C7	Hours per week per resource for maintenance			2	2	2
C8	Hourly cost per FTE (fully loaded)	A7		$53	$53	$53
Ct	Internal implementation and maintenance costs	(C1*C2*C3*C4)+ (C5*C6*C7*C8)	$76,320	$11,024	$11,024	$11,024

Source: Forrester Research, Inc.

Hardware Costs

This is the cost of server resources to run the solution for CLM. The composite organization allocates one server at a cost per server of $12,000. In addition to the base cost, the organization will incur an annual maintenance fee of 20% of the purchase price, at $2,400 per year. The organization also incurs the cost of setting up the server, which requires 10 hours. The total three-year cost equates to $18,930 (PV of $17,867).

Table 4
Hardware Costs– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
D1	Number of servers		1			
D2	Acquisition cost per server		$12,000			
D3	FTE hours required for server setup		10			
D4	Hourly cost per FTE (fully loaded)		$53			
D5	Ongoing maintenance cost	D2*20%		$2,400	$2,000	$2,000
Dt	Hardware expenses	D1*D2*D3*D5	$12,530	$2,400	$2,000	$2,000

Source: Forrester Research, Inc.

IBM Implementation Service Fees

The composite organization engages IBM Services to provide implementation support and training around the use of the solution for CLM and to aid in integration into the organization's existing processes. However, because the scope and nature of services provided will vary significantly on an implementation by implementation basis, we have not included the cost of IBM services in the financial model. For more information on services available for the solution for CLM, please view this overview at http://www.slideshare.net/ibmrational/issr-services-offerings-for-clm-20034320 or contact your IBM representative.

Total Costs

Table 5 summarizes the incremental costs incurred by the composite organization for implementing the solution for CLM over a three-year period.

Table 5
Total Costs – Non-Risk-Adjusted

Ref.	Metric	Initial	Year 1	Year 2	Year 3	Total	Present Value
Bt	Licensing fees (list price) and subscription and support fees	$0	($78,800)	($23,640)	($29,156)	($131,596)	($113,079)
Ct	Internal implementation and maintenance costs	($76,320)	($11,024)	($11,024)	($11,024)	($109,392)	($103,735)
Dt	Hardware expenses	($12,530)	($2,400)	($2,000)	($2,000)	($18,930)	($17,867)
	Total Costs (Original)	($88,850)	($92,224)	($36,664)	($42,180)	($259,918)	($234,681)

Source: Forrester Research, Inc.

Benefits

The benefits section illustrates how the quantified benefits briefly described in the Executive Summary section are calculated for the composite organization. Benefits described below are based on the use of the solution for CLM built on the Jazz platform, which includes RTC, RQM, and RRC.

Expanded Geographic Coverage

Several of IBM's customers were able to offshore some of the development resources, leveraging a distributed development model for the first time and leading to better coverage across different time zones and lower costs for staff in new office locations. One customer noted that, "Before we were limited in our ability to locate development resources abroad because much of the communication and work item tracking happened with some face-to-face conversations. We opened development locations in several new areas such as India and China, locations where there are sizable talent pools and where it costs less for us to take on staff. The solution for CLM is instrumental in allowing us to coordinate across these locations." Another customer mentioned, "Having people in different locations before wasn't a good option. Because of the high degree of communication we were doing by e-mail, phone, or with each other, we had only one main office. We are now considering secondary sites. I know the development team will grow over the next few years; some of the additional developers may get hired into new office locations and this will save us costs as we expand the size of the group."

For the composite organization, we assumed there was one new development office each having three to five developers and one-half to one full-time QA resource. Each new office experienced 50-60% savings on staff costs, the composite organization experienced $1,026,250 (PV of $844,256) in savings over the three-year period.

Table 6
Expanded Geographic Coverage– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
E1	Number of development offices enabled through use of the solution for CLM			1	1	1
E2	Project managers per office			1	1	1
E3	Salary per project manager at headquarters site			$130,000	$130,000	$130,000
E4	Developers per office			3	4	5
E5	Salary per developer at headquarters site			$110,000	$110,000	$110,000
E6	QA engineers per office			0.5	0.5	1
E7	Salary per QA engineer at headquarters site			$90,000	$90,000	$90,000
E8	Salary savings (based on geographic labor market differences)			60%	55%	50%
Et	Expanded geographic coverage	(E1*E2*E3*E8)+ (E1*E4*E5*E8)+ (E1*E6*E7*E8)	$0	$303,000	$338,250	$385,000

Source: Forrester Research, Inc.

Improved Team Coordination Capability

Many of IBM's customers used the Rational Team Concert capabilities in the solution for CLM to improve the communication and collaboration process. Interviews highlighted that prior to RTC, while documents and spreadsheets were a readily-available form of tracking information, "things got lost, and we'd have to rely on our memory to remember what needed to be done." Interviews reported that people spent more time searching through emails, documents and spreadsheets instead of getting actual work done. Additionally, important information was spread out amongst different team members, and not everyone had access to the information they needed – one company reported that there was "lots of misunderstandings and poor communication." Moving to RTC as part of the solution for CLM allowed team members from different teams, in different locations to have immediate access to the information they needed, leading to a much more streamlined process. "Most people get the latest version of things from RTC, don't bother asking or searching now, just look it up now." One interview estimated that they saved around 70% of time spent communicating. "Everyone knows what is happening now; everyone knows what's expected and

who's doing what. And it's not just impacting the development team, but is being used to update and funnel communications to finance and other business partners as well."

Prior to implementing RTC, both IT users as well as business users of the composite organization spent many hours communicating status updates, design and development needs, and updates on building, testing, and delivery. This was often slowed by the fact that the team was spread across different time zones, and processes would be held up waiting for updates from employees in other regions. Important updates were often lost in a proliferation of emails, important decisions were not documented in the right documents, and getting the right information to the right people at the right time was difficult and time consuming. Now, the composite organization has IT and business stakeholders using RTC to manage communications around requirements, design, work items, test cases, and delivery. The team has the ability to collaborate in real time and align their communications with actual work being done, allowing each role to have access to the data they need.

The composite organization saw a productivity improvement right away, although the first year benefit was smaller than subsequent years as individuals learned how to use the tool and became more fluent with RTC. Different individuals saw different efficiency gains based on how often they used the capabilities and how necessary they are to their role. Based on interview data, developers and testers experienced between 30% and 50% time savings for communication and collaboration activities. Our interviewees noted the project managers were strongly supported by the new capabilities, with initial savings of 30% and growing to 60% as they became more accustomed to the solution. Business partners also saw communication process efficiencies in how they gained information about products, initially at a 5% savings and increasing to 15%. The productivity benefit for the composite organization was $639,600 (PV of $519,566) over the three year period.

Table 7
Improved Team Coordination Capability– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
F1	Number of project managers			2	2	2
F2	Percent of time spent on project collaboration			20%	20%	20%
F3	Time savings per project manager			30%	45%	60%
F4	Salary per project manager (fully loaded)	A4		$130,000	$130,000	$130,000
F5	Number of developers			18	18	18
F6	Time savings per developer			30%	40%	50%
F7	Salary per developer (fully loaded)	A6		$110,000	$110,000	$110,000
F8	Number of QA engineers			2	2	2
F9	Time savings per QA engineer			30%	40%	50%
F10	Salary per QA engineer (fully loaded)	A8		$90,000	$90,000	$90,000
F11	Number of business partners			2	4	8
F12	Time savings per business partner			5%	10%	15%
F13	Salary per business partner (fully loaded)	A10		$150,000	$150,000	$150,000
Ft	Improved team coordination capability	(F1*F2*F3*F4)+ (F5*F2*F6*F7)+ (F8*F2*F9*F10)+ (F11*F2*F12*F13)	$0	$148,200	$208,200	$283,200

Source: Forrester Research, Inc.

Enhanced Project Delivery Capacity

Several customers noted that their project delivery capacity increased as a result of implementing the solution for CLM. One customer mentioned, "Right now we are running three projects in Rational Team Concert simultaneously and all projects are on time. We used to be restricted to running only one project at a time. Project managers were using Word and Excel to track things, and everything took longer. It was not uncommon that we'd have year-long delays on some projects. Our capacity to deliver, and deliver on time, has improved." Another customer noted, "We've been able to organize everything in the IBM Rational solution for CLM. Before, we had poor planning, poor communication, and poor integration. Now, we've backlogged all of our demand in the system, can clearly see where projects and tasks stand, and have better communication. This allows us to focus less on digging for information and more on getting the real work done."

For the composite organization, the number of projects delivered doubled in its first year of implementing the solution for CLM (from 10 to 20 projects), then continued to improve in subsequent years as the development team became increasingly adept at using the solution for CLM (reaching 30 projects by the third year). This all occurred without the development organization needing to add additional staff to accommodate the growing project delivery capacity. Over the three year period, the benefits incurred by the organization were $282,330 (PV of $229,088).

Table 8
Enhanced Project Delivery Capacity– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
G1	Project volume prior to the solution for CLM			10	10	10
G2	Project volume with the solution for CLM			20	25	30
G3	Incremental projects per year	G2-G1		10	15	20
G4	Project manager hours per project			20	20	20
G5	Project manager hourly rate			$63	$63	$63
G6	Developer hours per project			80	80	80
G7	Developer hourly rate			$53	$53	$53
G8	QA engineer hours per project			18	18	18
G9	QA engineer hourly rate			$43	$43	$43
Gt	Enhanced project delivery capacity	(G3*G4*G5)+ (G3*G6*G7)+ (G3*G8*G9)	$0	$62,740	$94,110	$125,480

Source: Forrester Research, Inc.

Improved Development And Testing Productivity

Our interviewed customers reported savings on net new coding. Our interviews noted that the solution for CLM allows them to store code in a single repository, where as they used to "have things all over the place." New coding as an entire process has become smoother, with one interviewee saying, "We have gone from a much bigger, bulkier process to something that is much more streamlined for development." Another client noted that they have three new projects currently in development, and all projects are on time – they noted that "it would be fair to say that [before] these projects would be about a year delayed, using the same number of resources that we use now." The solution for CLM provides developers with visibility into the requirements they will be implementing, and ensure that everyone involved understands the design and construction, project planning, change and configuration management of the project. It

allows developers in different time zones to stay up to date with what their counterparts are doing, and allows the development process to flow more fluidly.

Another key benefit area noted in the interviews is time savings on testing and quality assurance. This is another area where interviewees reported very manual processes, supported primarily by documents and spreadsheets. As one interviewee put it, they "used to do all our support tickets and write all tests in spreadsheets." With the solution for CLM, customers find improved testing and quality assurance processes, supported by increased automation and visibility. They are able to get to testing faster, and the actual testing process itself is significantly faster than before. This process ties in closely with defects and changes, and combined they are a powerful time savings to users of the solution for CLM.

To calculate this benefit for the composite organization, Forrester estimates that approximately 40% of developers' time is spent on new development/coding. Initially developers experienced a 20% time savings on new coding, growing to 30% as they learned the solution for CLM. The QA engineers spend the bulk of their time on testing (80%), and with the use of the solution for CLM, they have seen a significant time savings, starting at 50% and increasing to 60% of their time spent on testing. For the composite organization, the productivity benefit over the three years is $151,800 (PV of $124,920).

Table 9
Improved Development And Testing Productivity – Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
H1	Developer salary (fully loaded)	A6		$110,000	$110,000	$110,000
H2	Percent of developer time spent on coding and development			40%	40%	40%
H3	Developer time savings			20%	25%	30%
H4	QA engineer salary (fully loaded)	A8		$90,000	$90,000	$90,000
H5	Percent of QA time spent on testing			80%	80%	80%
H6	QA time savings			50%	55%	60%
Ht	Improved development and testing productivity	(H1*H2*H3)+ (H4*H5*H6)	$0	$44,800	$50,600	$56,400

Source: Forrester Research, Inc.

Reduced Cost For Rework And Resolving Issues

Our interviewed organizations reported difficulties managing the defects and changes process prior to implementing RTC as part of the solution for CLM. One company noted that, in order to address a defect, "We had to do many things to get very few outcomes – at the end of the day, we worked a lot and had very little to show for it." Prior to the implementation of RTC, the defects and changes process was extremely manual, with no formal list showing all the changes to code and little to no version control. "Before we had Rational Team Concert, we would use an 'update' column in an issues and defect log, and try to ensure it would be filled in consistently by everyone – very risky because not everyone might remember to fill it in." In the prior environment, organizations reported that they would manually sift through code to locate the issue. One interview reported that their former process took three times as long just to figure out what an issue was. Now, with RTC, there is visibility into the defects and change process, and the solution provides links to the code. Organizations reported that RTC provides a higher degree of confidence in the documentation of changes and enables version control.

Table 11 illustrates the time savings on defects and changes for the composite organization. Prior to implementing RTC, development projects had multiple issues per year. With RTC, the number of issues per project decreased from 3 to between 0.5 -1 issue per project annually. For simplicity, the number of defects and changes per month was held constant throughout the study. Each issue took an average of eight developer hours to resolve. The total benefit to the organization over three years was $72,610 (PV of $59,021).

Table 10

Reduced Cost For Rework And Resolving Issues– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
I1	Projects completed per year			20	25	30
I2	Number of issues per project without the solution for CLM			3	3	3
I3	Number of issues per project without the solution for CLM			1	0.75	0.5
I4	Issues avoided per project with the solution for CLM	I2-I3		2	2.25	2.5
I5	Developer hours per incident (prior to the solution for CLM)			8	8	8
I6	Developer hourly rate (fully loaded)	A7		$53	$53	$53
It	Reduced cost for rework and resolving issues	I1*I4*I5*I6	$0	$16,960	$23,850	$31,800

Source: Forrester Research, Inc.

Enhanced Reporting And Planning Capability

Before the implementation of the solution for CLM, customers found that the data required for building reports and plans tended to be separated, and collecting, formatting. Reporting to each stakeholder group consumed a significant amount of time for the project managers. As one client stated, "Our major issues were time and planning. We had poor planning, and that lead to bad timing." Separate from the communication process, just building out the plans and reports took many hours, with one client noting that project managers spent weeks trying to catch up and document the paper work for their projects. As we have seen in other areas, the implementation of the solution for CLM allowed for a streamlined process to creating reports and planning for project managers, significantly decreasing the time they spent creating reports and plans. Having a better process for reporting and planning leads to improvements in all areas of the project, ensuring that the project plan is integrated with each area of the project. Customers have found that it allows for all stakeholders to understand where the process is, and allows for timelines to be met.

To calculate this benefit, Forrester assumes that each of the composite organization's project managers spends an average of 16 hours per month creating reports and plans for projects, which are used internally with the development team to create alignment within the team and outside the development team for management reporting and planning. Based on our interviews, we estimated that after implementing the solution for CLM, reporting and planning time was cut down initially to 4 hours, and progressively decreased to 2 hours per month. With an hourly rate of $63 per project manager, the total benefit that accrues to the organization over the three year period is $$58,968 (PV of $48,643).

Table 11

Enhanced Reporting And Planning Capability– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
J1	Number of project managers			2	2	2
J2	Hours spent per month on reporting and planning without the solution for CLM			16	16	16
J3	Hours spent per month on reporting and planning with the solution for CLM			4	3	2
J4	Time savings per month			12	13	14
J5	Months per year			12	12	12
J6	Project manager hourly rate (fully loaded)	A5		$63	$63	$63
Jt	Enhanced reporting And planning capability	J1*J4*J5*J6	$0	$18,144	$19,656	$21,168

Source: Forrester Research, Inc.

Eliminated Legacy Software Licensing Fees

As a result of implementing the solution for CLM, the composite organization eliminates use of one legacy software configuration management tool, which has more limited and some overlapping functionality with the solution for CLM. Based on customer feedback, the annual maintenance costs for the legacy solution are $35,000, which the organization no longer incurs each year after implementing the solution for CLM. The total costs avoided from discontinuing use of the legacy software are $105,000 (PV of $87,040).

Table 12

Eliminated Legacy Software Licensing Fees– Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
K1	Maintenance fees paid annually for legacy systems before the solution for CLM			$35,000	$35,000	$35,000
Kt	Eliminated legacy software licensing fees	K1	$0	$35,000	$35,000	$35,000

Source: Forrester Research, Inc.

Total Benefits

Table 13 shows the total quantified benefits for the composite organization from adopting the solution for CLM.

Table 13
Total Benefits– Non-Risk-Adjusted

Ref.	Metric	Initial	Year 1	Year 2	Year 3	Total	Present Value
Et	Expanded geographic coverage	$0	$303,000	$338,250	$385,000	$1,026,250	$844,256
Ft	Improved team coordination capability	$0	$148,200	$208,200	$283,200	$639,600	$519,566
Gt	Enhanced project delivery capacity	$0	$62,740	$94,110	$125,480	$282,330	$229,088
Ht	Improved development and testing productivity	$0	$44,800	$50,600	$56,400	$151,800	$124,920
It	Reduced cost for rework and resolving issues	$0	$16,960	$23,850	$31,800	$72,610	$59,021
Jt	Enhanced reporting and planning capability	$0	$18,144	$19,656	$21,168	$58,968	$48,643
Kt	Eliminated legacy software licensing fees	$0	$35,000	$35,000	$35,000	$105,000	$87,040
	Total benefits (original)	$0	$628,844	$769,666	$938,048	$2,336,558	$1,912,533

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for some future additional investment. This provides an organization with the "right" or the ability to engage in future initiatives but not the obligation to do so. There are multiple scenarios in which a customer might choose to implement RTC and later realize additional uses and business opportunities. Flexibility would also be quantified when evaluated as part of a specific project (see detail in Appendix B).

The solution for CLM creates inherently more flexible organizations. From an organizational standpoint, the solution for CLM allows additional staff to be added and trained easier due to a more structured environment and set of processes. Location of employees is less of an issue due to the fact that collaboration makes workflows more fluid and having globally-located teams is less likely to interrupt a project. IBM's support of Agile development methods also makes it easier for additional projects to be added. IBM's solution for CLM is built on the Jazz platform and is a combination of three products – RTC, RQM, and RRC – each bringing individual benefits to an organization, but

greater benefits when used in unison to manage a product. Organizations have the opportunity to relatively easily integrate these additional capabilities into their existing environments to gain additional benefits from other IBM products.

Risk

Forrester defines two types of risk associated with this analysis: implementation risk and impact risk. "Implementation risk" is the risk that a proposed investment in the solution for CLM may deviate from the original or expected requirements, resulting in higher costs than anticipated. "Impact risk" refers to the risk that the business or technology needs of the organization may not be met by the investment in the solution for CLM, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

Forrester quantitatively captured investment and impact risk by directly adjusting the financial estimates results in more meaningful and accurate estimates and a more accurate projection of the ROI. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates. The risk-adjusted numbers should be taken as "realistic" expectations since they represent the expected values considering risk.

The following implementation risks that affect costs are identified as part of this analysis:

- Increased licensing costs and/or hardware requirements.
- Higher than anticipated internal or external resource requirements for initial implementation, training, and ongoing maintenance.

The following impact risks that affect benefits are identified as part of the analysis:

- Employee use or buy-in of the solution for CLM. Note that this was an area routinely mentioned by customers; while implementing the software usually went smoothly, changing the process and having developers and other users use the software was often noted as a pain point.
- Lower than expected productivity savings for development and testing, problem resolution, and/or planning and reporting activities.
- Continued use of legacy collaboration or version control systems despite implementation of the solution for CLM, which would merit continuing to pay maintenance fees for legacy systems.

Table 15 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Table 14
Cost And Benefit Risk Adjustments

Costs	Low	Most likely	High	Mean
Licensing fees (list price) and subscription and support fees	100%	100%	125%	108%
Internal implementation and maintenance costs	100%	100%	200%	133%
Hardware expenses	100%	100%	125%	108%
Benefits	**Low**	**Most likely**	**High**	**Mean**
Expanded geographic coverage	50%	100%	110%	87%
Improved team coordination capability	80%	100%	103%	94%
Enhanced project delivery capacity	80%	100%	103%	94%
Improved development and testing productivity	80%	100%	103%	94%
Reduced cost for rework and resolving issues	80%	100%	103%	94%
Enhanced reporting and planning capability	80%	100%	103%	94%
Eliminated legacy software licensing fees	80%	100%	103%	94%

Source: Forrester Research, Inc.

Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Financial Summary

The financial results calculated in the Costs and Benefits sections can be used to determine the return on investment, net present value, and payback period for the organization's investment in the IBM Rational solution for CLM built on the Jazz platform. These are shown in Table 15 below.

Table 15
Cash Flow — Non-Risk-Adjusted

	Cash flow — Original estimates					
	Initial	Year 1	Year 2	Year 3	Total	Present value
Costs[1]	($88,850)	($92,224)	($36,664)	($42,180)	($259,918)	($234,681)
Benefits	$0	$628,844	$769,666	$938,048	$2,336,558	$1,912,533
Net benefits	($88,850)	$536,620	$733,002	$895,868	$2,076,640	$1,677,852
ROI	715%					
Payback period	2 months					

Source: Forrester Research, Inc.

Table 16 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 15 in the Risk section to the cost and benefits numbers in Tables 5 and 13.

[1] Licensing costs and subscription and support fees were calculated at list price.

Table 16
Cash Flow — Risk-Adjusted

Cash flow — Risk-adjusted estimates						
	Initial	Year 1	Year 2	Year 3	Total	Present value
Costs[2]	($115,038)	($102,358)	($42,353)	($48,310)	($308,059)	($279,390)
Benefits	$0	$569,903	$699,809	$854,815	$2,124,527	$1,738,683
Net benefits	($115,038)	$467,545	$657,455	$806,505	$1,816,468	$1,459,294
ROI	522%					
Payback period	3 months					

Source: Forrester Research, Inc.

[2] Licensing costs and subscription and support fees were calculated at list price.

IBM Rational solution for Collaborative Lifecycle Management

According to IBM, the Rational solution for CLM helps manage complexity, improve software quality, speed delivery, reduce costs, and increase collaboration across the entire team. For its customers, IBM views delivering innovative, quality software as helping to unify teams spread across time zones, geographies, processes, platforms, tools and an extended supply chain involving contractors and vendors in outsourced projects. The Rational solution for Collaborative Lifecycle Management is built on the Jazz platform and is designed to deliver effective ALM for traditional, agile or hybrid teams.

The Rational solution for CLM is a set of seamlessly integrated tools that work together as one:

- Rational Team Concert™ (RTC) integrates task tracking, source control and agile planning with continuous builds and a configurable process to adapt to the way you work.
- Rational Quality Manager (RQM) delivers capabilities for test management including test planning, creation and execution, focusing on improving delivery time by coordinating activities and providing greater visibility across requirements, quality and change management.
- Rational Requirements Composer (RRC) delivers capabilities for capturing, managing and tracing requirements throughout the application development lifecycle.

For more information about the solution for CLM, visit: http://www-01.ibm.com/software/rational/alm/collaborate/.

The solution for CLM aims to help organizations achieve five imperatives for success:

- Maximize product value with in-context collaboration.
- Accelerate time to delivery with real-time planning.
- Improve software quality with lifecycle traceability.
- Refine predictability with development intelligence.
- Reduce costs with continuous improvement.

Faster, easier, incremental deployments and adoption of the solution for CLM is possible through:

- Affordable licensing options for smaller teams. See details: http://www-03.ibm.com/software/products/us/en/ratlclm.
- Building an efficient compliant software development environment. Learn how: https://jazz.net/library/article/856.
- Out-of-the-box and customizable reports. Learn more: https://jazz.net/products/clm/features/clm_intelligence.

- Improve mobile development team productivity with the solution for CLM integrated with IBM WorklightTM, an enterprise-grade development environment for code construction of native, web and hybrid mobile applications. Learn more: http://www-01.ibm.com/software/rational/mobile/.
- Unifying existing investments by connecting 3rd party and open source tools to the Rational open platform with Rational Lifecycle Integration Adapters. Visit: http://www-03.ibm.com/software/products/us/en/ratlia.
- Reducing capital, licensing operating and labor costs with IBM SmartCloud. Learn more: http://www.ibm.com/cloud-computing/us/en/paas.html?lnk=paas-body.
- JazzHub allows you to develop and collaborate on software projects in the cloud. Fully hosted task tracking, agile planning, and integrated source control so you have everything you need to develop your next app, feature or product. Visit: https://hub.jazz.net/.
- Accelerating SAP deployments and upgrades. See details: http://www-01.ibm.com/software/rational/solutions/sap/.

Appendix A: Composite Organization Description

For this TEI study, Forrester has created a composite organization to illustrate the quantifiable costs and benefits of implementing the IBM Rational solution for Collaborative Lifecycle Management, built on the Jazz platform, which includes Rational Team Concert (RTC), Rational Quality Manager (RQM), and Rational Requirements Composer (RRC).

Based on the interviews with the four existing customers provided by IBM, the composite organization that Forrester modeled from these results represents a multinational manufacturing organization with 10,000 employees which is headquartered in the UK. Software is an increasingly important aspect of the company's product development process as it switches from traditionally manual, basic offerings to more sophisticated products with automated, software-driven components and features. Therefore, the company expects steady growth in its software development groups as they play an increasingly greater role in product development, requiring improved processes for partnering with business and sales stakeholders and increased project delivery capacity and reliability.

The company is divided into different divisions, one of whom is using RTC, RQM, and RRC. This division's development team includes two project managers, eighteen developers, and two QA engineers, all working out of the headquarters location. In addition, the adoption of the solution for CLM enables the company to expand its geographic footprint by providing improved cross-location coordination tools. The division elects to open a second development site to enable coverage across different time zones and to leverage significant cost savings. The second development site, based out of India, includes one project manager, several developers, and a QA resource. The division is also considering expanding coverage of the development organization to tertiary sites in Asia and Europe.

The composite organization implemented the solution for CLM in two phases. The first phase was a pilot program to ensure the solution met their needs, to set up structure/templates, and to learn how to use solution. The initial pilot involved one project manager, three developers, and one QA engineer. The second phase included the remainder of the division's software development team, and was rolled out over the next 12 months. The development team takes on twenty to thirty projects per year using the solution for CLM. Phase one included three projects. Note that not all of the products offered by the company are tied to software projects.

Appendix B: Total Economic Impact™ Overview

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.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility.

Benefits

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place 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. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

Costs

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the form of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

Risk

Risk measures the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections, and 2) the likelihood that the estimates will be measured and tracked over time. TEI applies a probability density function known as "triangular distribution" to the values entered. At minimum, three values are calculated to estimate the underlying range around each cost and benefit.

Flexibility

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated.

The collaboration can only be used with additional investment in training at some future point in time. However, having the ability to capture that benefit has a present value that can be estimated. The flexibility component of TEI captures that value.

Appendix C: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Although the Federal Reserve Bank sets a discount rate, companies often set a discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their respective organization to determine the most appropriate discount rate to use in their own environment.

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.

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 net present value of cash flows.

Payback period: The breakeven point for an investment. The point in time at which net benefits (benefits minus costs) equal initial investment or cost.

Return on investment (ROI): A measure of a project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits minus costs) by costs.

A Note On Cash Flow Tables

The following is a note on the cash flow tables used in this study (see the example table below). The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1. Those costs are not discounted. All other cash flows in Years 1 through 3 are discounted using the discount rate (shown in Framework Assumptions section) at the end of the year. Present value (PV) calculations are calculated for each total cost and benefit estimate. Net present value (NPV) calculations are not calculated until the summary tables and are the sum of the initial investment and the discounted cash flows in each year.

Table [Example]
Example Table

Ref.	Category	Calculation	Initial cost	Year 1	Year 2	Year 3	Total

Source: Forrester Research, Inc.

Appendix D: Endnotes

[1] Forrester risk-adjusts the summary financial metrics to take into account the potential uncertainty of the cost and benefit estimates. For more information on Risk, please see Appendix B.