The Total Economic Impact™ Of IBM IGNITE Quality And Test

Cost Savings And Business Benefits Enabled By IGNITE Quality And Test

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ABOUT FORRESTER CONSULTING

Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in 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 forrester.com/consulting.

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Benefits And Costs

71%

Reduction in the number of test cases through optimization

46%

Increase in test engineer efficiency

Increase test case automation from 5% to 87%

Executive Summary

Businesses cannot afford the risk of poorly developed code, but software shops are challenged to bring high quality code to market with speed. As Forrester Principal Analyst Diego Lo Giudice wrote: "Everybody wants to accelerate their digital transformation, and most businesses get that software makes the big difference. However, they struggle to get their organizations to deliver better software faster. In 2018, 27% of 3,228 global developers surveyed by Forrester indicated that their organization releases software monthly or faster; this was down considerably from 36% in 2017."[1]

IBM IGNITE Quality and Test provides software and services that help its customers meet the changing business requirements of today's modern application delivery practices and emerging platforms. IBM IGNITE Quality and Test helps organizations move from defect detection to prevention: optimizing the number and types of tests organizations run; automating the testing process; and using AI to analyze past defects and prevent them in the future.

IBM commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study to examine the potential ROI enterprises may realize by adopting IBM IGNITE Quality and Test. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of IBM IGNITE Quality and Test on their testing organizations.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed several customers with years of experience using IBM IGNITE Quality and Test. Prior to using IBM IGNITE, the customers used a "brute force" method of manual testing. Testing was often seen as a necessary evil in the software development lifecycle, which was slow, expensive, and riddled with errors that would thwart organizational efforts at faster software releases.

Key Findings

Quantified benefits. The following risk-adjusted present value (PV) quantified benefits are representative of those experienced by the interviewed companies, as realized by a composite organization built for this study:

› **Reduced test case volumes by 71% through optimization.** Organizations reported running numerous test cases which were often redundant or did not provide full coverage over testing requirements. Working with IBM IGNITE Quality and Test to identify duplicate and ineffective tests and optimize testing requirement coverage, interviewed organizations were able to eliminate 71% of test cases. For the composite organization, this eliminated over 54,000 test case executions per year, saving a risk-adjusted PV of $9.1 million over the three-year analysis.
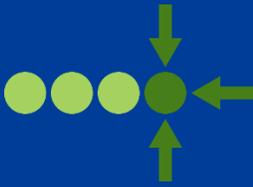
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ROI
324%

Benefits PV
$18.1 million

NPV
$13.9 million

Payback
<6 months

› **Increased test engineer efficiency by up to 46%.** Cost savings were achieved by optimizing and rightsizing the number of test cases needed to both ensure full coverage of requirements and to drive efficiencies in designing, building, managing, and maintaining test automation scripts. As a result, each testing engineer was able to increase the number of test cases they coul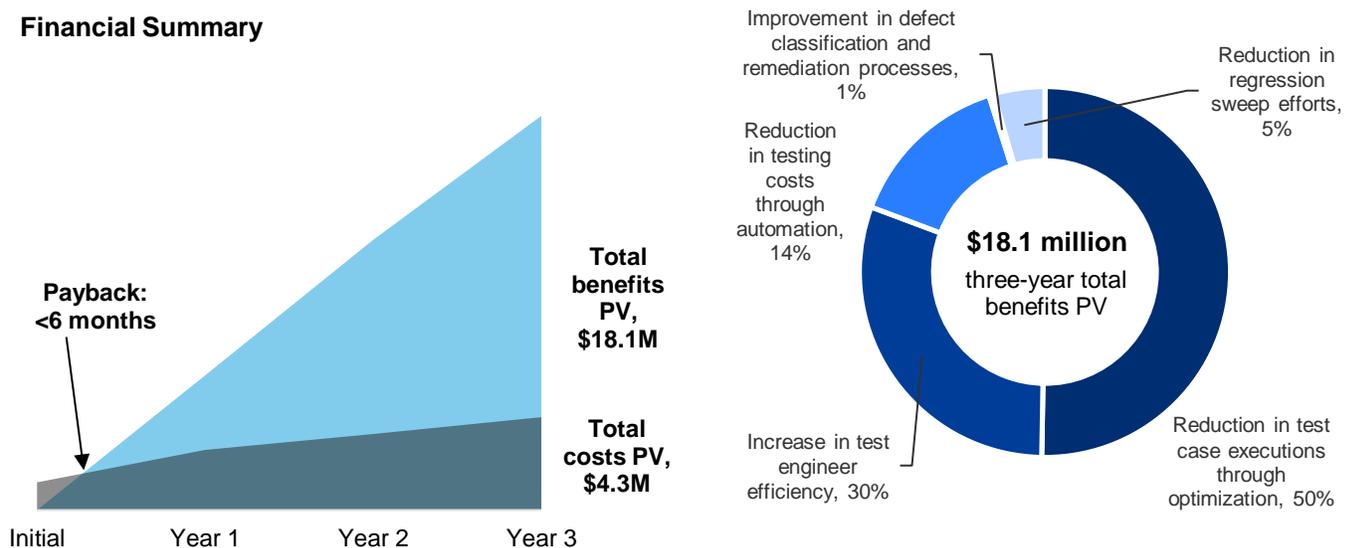d run annually by between 30% and 46%, helping organizations drive efficiencies that could be reinvested in new business and client-facing applications. The director of quality assurance at one retailer stated, "We are doing three times the work with only 20% more staff." Over the three-year analysis, testing efficiencies saved the composite organization a risk-adjusted PV of $5.5 million.

› **Increased test case automation from 5% to 87% of test case executions.** Before working with IBM IGNITE Quality and Test, testing was an expensive, manual process. Our analysis found that interviewees were able to increase test automation from 5% of test executions to 87% of test executions, helping drive 25% reductions in the cost to run each test case. Over the three-year analysis, test case automation saved the composite organization a risk-adjusted PV of $2.6 million.

› **Reduced invalid defects by 25%.** Customers were able to catch 24% more defects prior to user acceptance testing (UAT) and reduce the number of defects escaping to production by 30%. Furthermore, while customers varied in their defect classification and remediation processes, one company was able to better identify and classify its defects, reporting a 25% reduction in invalid defects. Over the three-year analysis, better defect classification saved the composite organization a risk-adjusted PV of $80,276.

› **Shortened monthly regression sweep process from six days to one day, saving customers $60,000 per month**. IBM IGNITE Quality and Test enhanced the productivity of testing teams cutting the time it took to perform monthly regression sweeps from an average of six days to one day, saving $60,000 per month. Over the three-year analysis, the reduction is regression sweep efforts saved the composite organization a risk-adjusted PV of $805,740.

Financial Summary

Payback: <6 months

Total benefits PV, $18.1M

Total costs PV, $4.3M

Initial | Year 1 | Year 2 | Year 3

$18.1 million three-year total benefits PV

Improvement in defect classification and remediation processes, 1%

Reduction in regression sweep efforts, 5%

Reduction in testing costs through automation, 14%

Increase in test engineer efficiency, 30%

Reduction in test case executions through optimization, 50%

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Unquantified benefits. The interviewed organizations experienced the following benefits, which are not quantified for this study:

› **Changed perception of test.** Test organizations are often perceived as a bottleneck or a "necessary evil." As businesses seek to bring new products to market faster and accelerate their release cadences, the pressure on test teams will continue to increase. With IBM IGNITE Quality and Test, testing teams are moving through the software development lifecycle faster than ever, detecting defects early and changing the perception of testing organizations from blockers to enablers.

› **Increased quality through automation.** Automated testing using IBM IGNITE Quality and Test makes testing repeatable and removes human error. One organization reported a 24% increase in defects found prior to user acceptance testing and a 30% reduction in defects escaping to production as a result of its investments in IBM IGNITE.

Costs. The interviewed organizations experienced the following risk-adjusted PV costs:

› **Professional services, licensing, change management, and training costs totaling $1,855,077.** These are the fees paid to IBM to implement and leverage IBM IGNITE Quality and Test on an ongoing basis. This cost category also includes professional services and resource costs needed for change management and upfront and ongoing training on modern testing techniques.

› **Internal test engineering resource costs totaling $2,417,844.** These are the internal resource costs to have company engineering resources work alongside IBM professionals in an oversight and self-learning capacity, with the objective of reducing the organization's reliance on third-party testing support and subject matter expertise. The model assumes a blended on-shore/off-shore salary rate for testing engineers of $78,624 per year, with a 2.5% annual salary growth rate in subsequent years of the analysis. In addition, this category includes the internal resource costs to support implementation of IBM IGNITE Quality and Test, which assumes local testing resource utilization at a salary rate of $151,840 annually per FTE.

Forrester's interviews with three existing customers and subsequent financial analysis found that an organization based on these interviewed organizations experienced benefits of $18.1 million over three years versus costs of $4.3 million, adding up to a net present value (NPV) of nearly $13.9M and an ROI of 324%.

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TEI Framework And Methodology

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing IBM IGNITE Quality and 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 IBM IGNITE Quality and Test can have on an organization:

DUE DILIGENCE
Interviewed IBM stakeholders and Forrester analysts to gather data relative to IBM IGNITE Quality and Test.

CUSTOMER INTERVIEWS
Interviewed three organizations using IBM IGNITE Quality and Test to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION
Designed a composite organization based on characteristics of the interviewed organizations.

FINANCIAL MODEL FRAMEWORK
Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewed organizations.

CASE STUDY
Employed four fundamental elements of TEI in modeling IBM IGNITE Quality and Test's impact: benefits, costs, flexibility, and risks. Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves to provide a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

> The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by IBM 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 report to determine the appropriateness of an investment in IBM IGNITE Quality And Test.

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.

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

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The IBM IGNITE Quality And Test Customer Journey

BEFORE AND AFTER THE IBM IGNITE QUALITY AND TEST INVESTMENT

Interviewed Organizations

For this study, Forrester conducted three interviews with IBM IGNITE Quality and Test customers. Interviewed customers include the following:

INDUSTRY	REGION	INTERVIEWEE	DETAILS
Retail	Headquartered in Europe with operations in North America	Director of quality assurance	Organization is in the 18th month of their DevOps journey.
Financial services	Headquartered in Europe with operations worldwide	Delivery manager	Organization is in the fifth year of their DevOps journey.
Financial services	Headquartered in the UK	Head of testing services	Organization is in the third year of their DevOps journey.

Key Challenges

Forrester identified the following common customer challenges and pain points experienced by interviewees prior to adopting IBM IGNITE Quality and Test:

› **Budget pressures.** Testing is expensive, and IT is always looking for opportunities in their budget for cost reduction. The head of testing at a financial services company said: "Testing is seen as being more expensive and it takes a long time. We were looking for ways to drive sustainable budget reductions. Testing was an area to act on to improve efficiency and therefore reduce costs."

› **Couldn't keep up with development partners as they transitioned to DevOps.** Companies knew they wanted to move to an agile DevOps culture, but they didn't have the underlying skills or tooling to accomplish that. Worse yet, testing organizations could not keep up with the accelerated pace and release cadences of their application development partners as they moved to a more agile approach.

› **Slow time-to-market for new applications and features.** Not only did companies struggle to work with their agile/DevOps counterparts, testing was a bottleneck and slowed down the process of bringing new code to their customers and employees.

› **Too many bugs leaked to production.** While testing was a key part of the software development lifecycle for the interviewed organizations, they felt it lacked quality in its execution. Interviewees described scenarios where poor defect identification, classification, and remediation processes resulted in bugs escaping into production, causing unnecessary delays or being channeled to inappropriate teams. Organizations wanted to change the mission of testing from one centered around defect detection to one focused on defect prevention.

"We're able to bring functionality faster into production with higher quality, which is critical given the growing demands of our customers. IGNITE drives quality and the speed of delivery. . . . This is where we have the most benefits."

Delivery manager, financial services

"By working with IGNITE, it frees the team up to run more effectively than they have in the past. They have a faster time-to-market, and can now work on new projects and things we've always wanted to do, but not been able to because they were always trying to get other work done."

Director of quality assurance, retail

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Key Results

The interviewees revealed the following key results and business outcomes from their investments in IBM IGNITE Quality and Test, including:

› **Better coverage, better quality, and better experience.** The head of testing at a financial services company reported: "From a quality point of view, IBM IGNITE Quality and Test helped ensure we have the optimum number of tests covered. Previously, we were running tests that didn't need to be run and we had gaps in our coverage. They helped us identify the right tests to optimize our coverage." The director of quality at another interviewee, said, "I almost tripled the capacity of my team, and was able to move some folks to our web team." By freeing up headcount for other application development and delivery initiatives, organizations were able to accelerate customer-facing projects that ultimately improve the customer experience.

› **Quality engineers instead of testers.** The three interviewed organizations described that the skills acquired through IBM IGNITE engagement helped upskill their staff from being merely testers to quality engineers. The head of testing at one interviewee said: "We are shifting from classic testers to test engineering where we want the mission to be automation first and only manual as a needed. We are going through a journey where we need to ensure everybody can write automation scripts."

› **Higher quality projects delivered faster.** The delivery manager at an interviewed financial services firm said, "We are seeing more speed, higher quality, more agility, more flexibility, less dependencies. . . . things where we benefit from an automation perspective." He continued: "In the past we had large programs and projects with a lot of overhead. Those functionalities we can now bring to production faster with more agility, and with less overhead and higher quality."

› **Doing more with less.** Prior to adopting IBM IGNITE, interviewees reported that over 50% of their software development lifecycle was previously consumed by testing. Now, with DevOps practices and IBM IGNITE Quality and Test in place, they have been able to focus more on functional releases and other high priority work rather than bug fixes. The delivery manager at one interviewee said, "Now that testing is running in the background, we are able to bring more functionality to production at this moment than ever before."

> "If I look at the old school waterfall method we had for testing, we automated between 5% and 10% of our testing processes. After adopting IGNITE and moving to agile, I would say we're at 80% test automation today."
>
> *Delivery manager, financial services*

> "This has given us the ability to reach the velocity to work faster, and the knowledge that we have the right coverage and the time to do the performance and security testing in the back end."
>
> *Director of quality assurance, retail*

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Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization is representative of the three companies that Forrester interviewed and is used to present the aggregate financial analysis in the next section. The composite organization that Forrester synthesized from the customer interviews has the following characteristics:

› The organization is a global, multibillion-dollar financial services organization that provides lending products to both consumers and businesses.

› This organization operates in the UK, Europe, and North America.

› The composition of the testing team is comprised of 80% offshore and 20% onshore resources. Forrester leveraged the large vendor average rates (i.e., >20,000 technology practitioners) for hourly test and quality assurance mobile roles for both offshore and local/onshore releases in calculating the blended $78,624 rate for a testing engineer.[2]

› The organization has transitioned from a waterfall to an agile software development methodology and is adopting DevOps and other modern application development practices.

› The organization's annual spend on third-party provided testing activities is $60 million per year prior to adopting IBM IGNITE Quality and Test.

› The organization runs 100,000 test cases per year and has 60 people working in its software testing and quality group and a total of 240 FTEs working in its software engineering group.

Key assumptions:
- 100,000 test cases run per year
- $79 per test case execution
- $78,624 blended salary rate for test engineers

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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	Reduction in test case executions through optimization	$3,666,390	$3,666,390	$3,666,390	$10,999,170	$9,117,769
Btr	Increase in test engineer efficiency	$1,737,590	$2,466,042	$2,527,693	$6,731,325	$5,516,772
Ctr	Reduction in testing costs through automation	$1,051,076	$1,051,076	$1,051,076	$3,153,228	$2,613,870
Dtr	Improvement in defect classification and remediation processes	$31,536	$32,324	$33,133	$96,993	$80,276
Etr	Reduction in regression sweep efforts	$324,000	$324,000	$324,000	$972,000	$805,740
	Total benefits (risk-adjusted)	$6,810,592	$7,539,832	$7,602,291	$21,952,716	$18,134,427

## Reduction In Test Case Executions Through Optimization

Using IBM IGNITE, interviewed organizations were able to reduce both their test case inventories and execution volumes while concurrently improving their coverage of testing requirements. Before adopting IBM IGNITE Quality and Test, organizations reported running numerous test cases which were often redundant or did not fully cover the applications' testing requirements, increasing the likelihood of defects escaping into production.

The head of testing at the financial services company said: "Our goal is to ensure we have the optimum coverage of testing requirements. Previously, we were running tests that didn't need to be run and we had gaps in our coverage. . . . Ultimately, it was all about improving coverage, but now we're running more intelligent tests as the result of these techniques." More deliberate and intelligent test design paid dividends; one interviewee described reducing the number of test cases by approximately 41,000 over the course of a year, a reduction of over 70% from its pre- IBM IGNITE baseline.

For the composite organization, Forrester assumes that:

› The composite organization ran 100,000 test cases per year before adopting IBM IGNITE Quality and Test.

› Consistent with our findings, the organization was able to reduce their test case inventory by 71% using IBM IGNITE Quality and Test.

The table above shows the total of all benefits across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of more than $18 million.
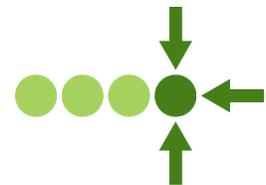
71% decrease in test case inventory through optimization

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> › The average cost per test case before adopting IBM IGNITE Quality and Test was $79. Please note, the Forrester model uses the pre-IBM IGNITE figure to avoid double counting cost savings from test case automation, which is described in detail in the section titled, "Testing Cost Reduction Through Automation."

Although each of the companies experienced a benefit from optimizing the number of test case executions, the level and nature of the benefit varied. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of $9,117,769.

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Reduction In Test Case Executions Through Optimization: Calculation Table					
A1	Total number of test cases pre-IBM IGNITE		100,000	100,000	100,000
A2	Reduction in number of test cases		71%	71%	71%
A3	Total number of test cases post-IBM IGNITE	A1*(1-A2)	29,000	29,000	29,000
A4	Average number of test case executions, per test case, pre-IBM IGNITE	Finding	1.3	1.3	1.3
A5	Average number of test case executions, per test case, post-IBM IGNITE	Finding	2.6	2.6	2.6
A6	Number of test case executions eliminated annually	(A1*A4)-(A3*A5)	54,600	54,600	54,600
A7	Average cost per test case pre-IBM IGNITE	Assumption from interviews	$79	$79	$79
At	Reduction in test case executions through optimization	A6*A7	$4,313,400	$4,313,400	$4,313,400
	Risk adjustment	↓15%			
Atr	Reduction in test case executions through optimization (risk-adjusted)		$3,666,390	$3,666,390	$3,666,390

Increase In Test Engineer Efficiency

One of the key drivers of cost savings from IBM IGNITE Quality and Test was achieved as a result of the improved efficiency in designing, building, managing, and running test automation scripts. Using IBM IGNITE, organizations were able to increase the capacity of tests each engineer could manage on an annual basis by an average of 30% to 46%, enabling organizations to reduce or repurpose a substantial portion of their testing staff.

Interviewed companies described how the size and make up of their testing teams changed as a result of IBM IGNITE Quality and Test. One interviewee stated, "We were able to reduce the number of test analysts, and because of that we were able to reduce the number of test leads because you need fewer managerial resources." For the composite organization, the model starts with the calculations developed in A3 (the total number of test cases post- IBM IGNITE) and A5 (the average number of test case executions, per test case, post-IBM IGNITE) in order to not double count benefits calculated in the previous section. In addition, this model assumes:

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> Consistent with our findings, the average annual number of test cases run per tester was 672, before adoption of IBM IGNITE Quality and Test.

> With an increase in test engineer efficiency using IBM IGNITE Quality and Test, interviewees were able to increase the number of tests run per engineer to 984, an increase of just over 46%. Only a fraction of this increase is realized in the first year of the analysis, as seen in row B5 below.

> As seen in row B7 below, the composite organization was able to reduce and repurpose 26 FTE testing resources in Year 1 of the analysis. Savings grew to 36 FTE testing resources in Years 2 and 3 of the analysis as the organization's use of IBM IGNITE assets and methodologies matured.

> The fully burdened blended rate for onshore and offshore testing engineers in Year 1 is $78,624, which grows at a 2.5% annualized rate in Years 2 and 3, as seen in row B8 below.

The results may vary based on the size of the organization, and the proportion of onshore and offshore resources. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of $5,516,772.

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Increase In Test Engineer Efficiency: Calculation Table					
B1	Total number of test cases post-IBM IGNITE	A3	29,000	29,000	29,000
B2	Average number of test case executions, per test case, post-IBM IGNITE	A5	2.6	2.6	2.6
B3	Number of test cases executed per year post-IBM IGNITE	B1*B2	75,400	75,400	75,400
B4	Number of test case executions, per tester, pre-IBM IGNITE (annual)	Finding	672	672	672
B5	Number of test case executions, per tester, post-IBM IGNITE (annual)	Finding	876	984	984
B6	Increase in test engineer efficiency using IBM IGNITE Quality and Test	(B5-B4)/B4	30%	46%	46%
B7	Number of testers saved, per year with IBM IGNITE	(B3/B4)-(B3/B5)	26	36	36
B8	Annual software testing engineer salary (fully loaded, blended rate)	30% benefit burden; 2.5% annual salary increase	$78,624	$80,590	$82,604
Bt	Increase in test engineer efficiency	B7*B8	$2,044,224	$2,901,226	$2,973,756
	Risk adjustment	↓15%			
Btr	Increase in test engineer efficiency (risk-adjusted)		$1,737,590	$2,466,042	$2,527,693

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Reduction In Testing Costs Through Automation

Before adopting IBM IGNITE Quality and Test, organizations reported that much of their testing was done manually with very few tools to support optimization, automation, or analytics. The interviewed organizations made tremendous gains in testing automation using IBM IGNITE, with one organization reporting an increase in test automation from less than 10% of total tests in 2016 to 87% of total tests in 2018. In addition to working with IBM IGNITE Quality and Test, organizations were also embracing a new agile way of working. The delivery manager at a financial services firm noted: "We've changed from an old school waterfall to a DevOps way of working. It's not just the fact that we have a solution that made us go from 10% to 80% in test automation, it's also a mindset that makes a tool like IBM IGNITE Quality and Test work."

For the composite organization, Forrester assumes that:

› The organization runs 75,400 test cases annually as mentioned in the previous benefit description.

› The organization increases the percentage of its automated tests from 5% of total tests to 87% of total tests, resulting in nearly 62,000 incremental automated test executions relative to the pre-IBM IGNITE environment.

› The organization's average cost per test case was $79 prior to adopting IBM IGNITE. As a result of test case automation, the organization saw a 25% reduction in its average cost per test case, a savings of $20.

The results may be different based on the following risk factors:

› Test cases are more (or less) complicated.

› The cost reduction per test case could be smaller depending on the level of automation and complexity of your current testing environment.

To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a three-year, risk-adjusted total PV of $2,613,870.

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Reduction In Testing Costs Through Automation: Calculation Table					
C1	Number of test cases executed per year post-IBM IGNITE	B3	75,400	75,400	75,400
C2	Percentage of test cases automated pre-IBM IGNITE	Finding	5%	5%	5%
C3	Percentage of test cases automated post-IBM IGNITE	Finding	87%	87%	87%
C4	Difference in number of executed test cases that are automated post-IBM IGNITE	(C1*C3)-(C1*C2)	61,828	61,828	61,828
C5	Cost per test case pre-IBM IGNITE	Assumption from interviews	$79	$79	$79
C6	Reduction in cost per test case post-IBM IGNITE	Finding	25%	25%	25%
C7	Savings per test case from automation (rounded)	C5*C6	$20	$20	$20
Ct	Reduction in testing costs through automation	C4*C7	$1,236,560	$1,236,560	$1,236,560
	Risk adjustment	↓15%			
Ctr	Reduction in testing costs through automation (risk-adjusted)		$1,051,076	$1,051,076	$1,051,076

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Improvement In Defect Classification And Remediation Processes

Organizations benefited from better defect identification as a result of their use of IBM IGNITE Quality and Test. One interviewee was able to catch 24% more defects prior to user acceptance testing (UAT) and reduce the number of defects escaping to production by 30%.

In addition, interviewees benefited from defect classification and remediation, with the head of testing at a financial services firm revealing a 25% reduction in invalid defects, or "false flags." As put by the interviewee: "We're not having to rework where we found that defect and only then to find out that it's invalid. In addition, we're not running redundant tests that we shouldn't run, which may lead to additional invalid defects."

For the composite organization, Forrester assumes that:

› 40 hours of work are saved per month across multiple testing engineers through the elimination of invalid defects. This includes the time avoided investigating these defects, writing new code, and rerunning tests.

› Invalid defects are assumed to be handled by an onshore testing engineer at a $73 hourly rate. The model assumes a 2.5% salary increase in Years 2 and 3 of the analysis.

This benefit will vary based on the maturity, size, and scope of the organization using IBM IGNITE's modern testing methodology and tools. To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $80,276.

25% reduction in invalid defects

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Improvement In Defect Classification And Remediation Processes: Calculation Table					
D1	Hours saved per month from better and more timely detection of defects		40	40	40
D2	Onshore test engineer hourly rate	2.5% annual salary increase	$73.00	$74.83	$76.70
D3	Months per year		12	12	12
Dt	Improvement in defect classification and remediation processes	D1*D2*D3	$35,040	$35,916	$36,814
	Risk adjustment	↓10%			
Dtr	Improvement in defect classification and remediation processes (risk-adjusted)		$31,536	$32,324	$33,133

Reduction In Regression Sweep Efforts

IBM IGNITE Quality and Test enhanced the productivity of testing teams by cutting the time it takes to perform monthly regression sweeps, where the business seeks to uncover defects missed in prior tests and validate testing coverage. One interviewee revealed that its monthly regression sweeps process went from six days to one day, saving $60,000 per month in labor costs.

The value of this benefit will vary depending on the maturity of the testing organization prior to adopting IBM IGNITE. Given the variance in

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reported ranges surrounding this benefit, Forrester adjusted this benefit downward by 10%, yielding a three-year, risk-adjusted total PV of $805,740.

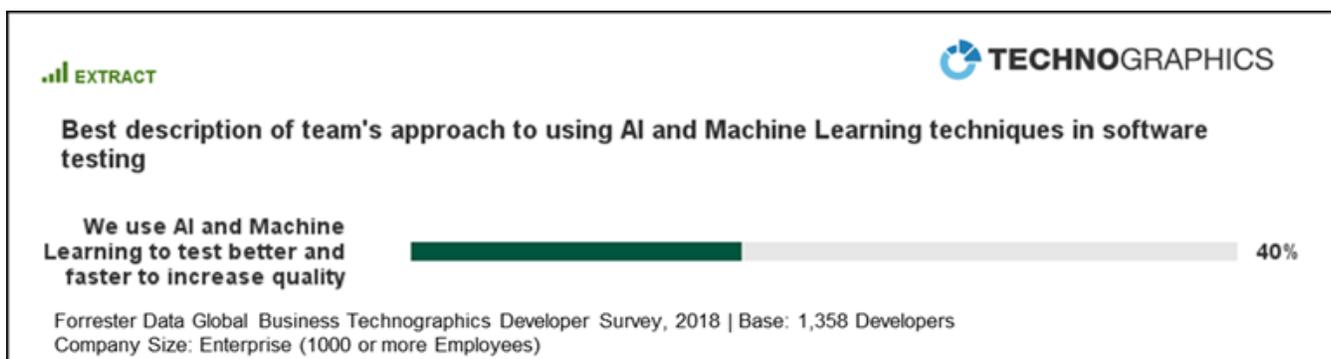| REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
Reduction In Regression Sweep Efforts: Calculation Table					
E1	Number of regression sweeps per year		12	12	12
E2	Labor costs saved from accelerated regression sweep		$60,000	$60,000	$60,000
E3	Productivity capture rate		50%	50%	50%
Et	Reduction in regression sweep efforts	E1*E2*E3	$360,000	$360,000	$360,000
	Risk adjustment	↓10%			
Etr	Reduction in regression sweep efforts (risk-adjusted)		$324,000	$324,000	$324,000

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Flexibility

The value of flexibility is clearly unique to each customer, and the measure of its value varies from organization to organization. There are multiple scenarios in which a customer might choose to implement IBM IGNITE Quality and Test and later realize additional uses and business opportunities, including:

› **Expanding test optimization to additional lines of business**. "We're driving our DevOps strategy to where testing is continuously integrated," the head of testing said. "Then it's about how we generate a road map for each of the business lines to understand how we can optimize and automate and drive coverage improvement."

› **Utilizing and expanding use of AI capabilities to improve defect classification, detection, and prevention.** Organizations reported that once their automation capabilities were solid, they wanted to expand their defect classification and detection capabilities to shift to a more predictive model. The delivery manager of one financial services firm is running a pilot around these capabilities and said: "We want to detect and solve defects faster and link them to the right people. Or, even better, we can just automatically resolve the issue and run the test again. This will bring even more speed to the process." Forrester's Business Technographics® data reflects what was reported in the interviews.[3] Organizations are starting to use AI and machine learning technologies for increased automation resulting in better quality. As companies adopt more of these capabilities the ROI of these solutions will also increase as a result of eliminating unnecessary rework.

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

> Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for a future additional investment. This provides an organization with the "right" or the ability to engage in future initiatives but not the obligation to do so.

⊪ EXTRACT   **TECHNO**GRAPHICS

Best description of team's approach to using AI and Machine Learning techniques in software testing

We use AI and Machine Learning to test better and faster to increase quality   40%

Forrester Data Global Business Technographics Developer Survey, 2018 | Base: 1,358 Developers
Company Size: Enterprise (1000 or more Employees)

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Analysis Of Costs

QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE

Total Costs

REF.	COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Ftr	Professional services, licensing, change management, and training costs	$217,304	$1,194,215	$349,940	$349,940	$2,111,400	$1,855,077
Gtr	Internal testing engineering resource costs	$1,047,696	$452,088	$556,068	$664,965	$2,720,817	$2,417,844
	Total costs (risk-adjusted)	$1,265,000	$1,646,303	$906,009	$1,014,905	$4,832,217	$4,272,921

Professional Services, Licensing, Change Management, And Training Fees

Most organizations interviewed by Forrester started their testing transformation initiatives with a proof of concept (PoC) around IBM IGNITE Quality and Test. Depending on the existing relationship with IBM and the scope of their testing environment, interviewees incurred varying engagement fees for their pilot projects. Interviewees also dedicated internal resources to the PoC initiative, with one interviewee with an unusually long PoC timeline dedicating a team of six to seven FTE resources to the PoC project over a 12-month period to set up the framework.

Beyond the PoC, interviewees incurred ongoing services and software licensing fees for use, advisory, and training around IBM IGNITE Quality and Test. Change management was another common investment area, with one interviewee creating a team to address the massive change they were undertaking. According to the head of testing services at that firm: "We wanted to make sure we looked into our processes internally to make sure they were optimized. We established a joint program team between IBM and [Company] with the clear objective to transform our service to where we had great people and processes with optimized testing."

Based on the characteristics of the composite organization, Forrester illustrated the costs of the study using the following assumptions:

› The organization paid $60,000 in proof-of-concept engagement fees to IBM to help implement and validate the effectiveness of IBM IGNITE Quality and Test.

› In addition to the IBM engagement, the organization incurred an additional $128,960 in outside professional services and software licensing costs over the course of a 12-month pilot and proof-of-concept period. Notably, the proof of concept typically operates on a significantly shorter timelines than 12 month, and other organizations may require incur significantly fewer professional services and technology costs than those interviewed for this case study.

The table above shows the total of all costs across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to be a PV of nearly $4.3 million.

Components of a typical service include:

- Consulting to redefine organization structure, operating model, roles and responsibilities.
- Test maturity improvement road map and execution.
- Practice standardization, test optimization, automation, and analytics gains.
- Skill refresh through curated trainings and workshops.
- SLA and KPI management.
- Organization change management.

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- The organization pays $200,000 annually to IBM for IBM IGNITE Quality and Test software licensing, advisory services, and training.

- In Year 1 of the analysis, the organization invests significantly in change management work done by its internal program team, which totaled $600,000.

- The composite organization incurs the training costs shown in row F4 for intense, workshop environment training of internal testing resources. Note that this cost includes the salary costs of trained employees, not the expense of IBM provided training included in the IBM IGNITE Quality and Test fees in row F2 below.

The costs for the professional services, PoCs, licensing, change management, and training will vary due to the following possible factors:

- Increased training may be required depending on the existing aptitude and skill sets of each organization's testing team.

- Size and scope of the testing organization.

To account for these risks, Forrester adjusted this cost upward by 15%, yielding a three-year, risk-adjusted total PV of $1,855,077.

> Implementation risk is the risk that a proposed investment may deviate from the original or expected requirements, resulting in higher costs than anticipated. The greater the uncertainty, the wider the potential range of outcomes for cost estimates.

Professional Services, Licensing, Change Management, And Training Fees: Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
F1	IBM IGNITE PoC engagement fees		$60,000			
F2	Other professional service and technology startup costs		$128,960			
F3	IBM IGNITE fees			$200,000	$200,000	$200,000
F4	Change management professional services			$600,000		
F5	Annual testing engineer training expenses			$238,448	$104,296	$104,296
Ft	Professional services, licensing, change management, and training fees	F1+F2+F3+F4+F5	$188,960	$1,038,448	$304,296	$304,296
	Risk adjustment	↑15%				
Ftr	Professional services, licensing, change management, and training fees (risk-adjusted)		$217,304	$1,194,215	$349,940	$349,940

Internal Testing Engineering Resource Costs

Interviewees told Forrester that they worked alongside IBM IGNITE Quality and Test employees in an oversight and self-learning capacity, with the objective of reducing the organization's reliance on third-party testing support and subject matter expertise. In calculating internal testing resource costs for the composite organization, Forrester assumes:

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- The company staffed six full-time onshore software testing and quality engineers from their team to work alongside the IBM IGNITE Quality and Test team over the course of the 12-month pilot and proof of concept. Note that readers may choose to invest significantly fewer resources and time into their own proof-of-concept initiative, limiting their internal resource costs. Since this model assumes these are internal, local software-testing resources, Forrester used a fully burdened annual salary of $151,840.

- In Year 1, the team had a total of five internal test engineers working with IBM IGNITE Quality and Test. In Years 2 and 3, the company added an additional FTE each year as they relied less on IBM and other third-party providers for testing and quality assurance support and subject matter expertise. Labor costs for ongoing software testing and quality engineering resources are calculated at a blended onshore/offshore rate of $78,624 per year.

- The model assumes a 2.5% salary increase per year for ongoing software testing and quality engineering resources.

To account for potential variability in salaries across regions and industries, Forrester adjusted this cost upward by 15%, yielding a three-year, risk-adjusted total PV of $2,417,844.
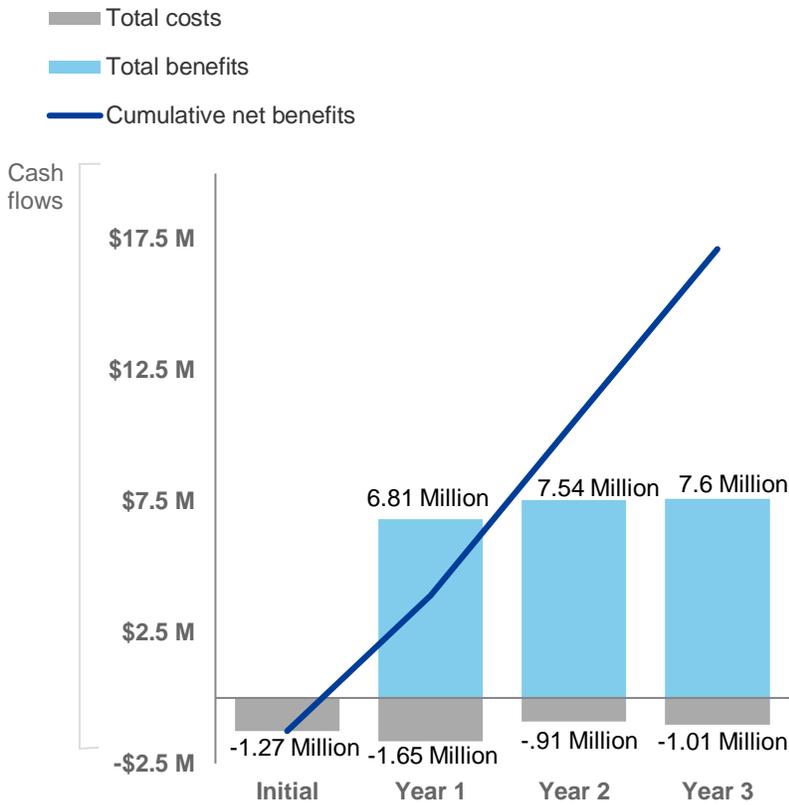
REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
**Internal Testing Engineering Resources: Calculation Table**
G1	Number of FTEs (startup)		6			
G2	Number of FTEs (ongoing)			5	6	7
G3	Salary rate for local software test and quality engineers		$151,840			
G4	Blended onshore/offshore salary rate for software test and quality engineers	2.5% annual salary increase	$78,624	$78,624	$80,590	$82,604
Gt	Internal testing engineering resources	(G1*G3)+(G2*G4)	$911,040	$393,120	$483,538	$578,230
	Risk adjustment	↑15%				
Gtr	Internal testing engineering resources (risk-adjusted)		$1,047,696	$452,088	$556,068	$664,965

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Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)

- Total costs
- Total benefits
- Cumulative net benefits

Cash flows

$17.5 M

$12.5 M

$7.5 M

6.81 Million   7.54 Million   7.6 Million

$2.5 M

-$2.5 M

-1.27 Million   -1.65 Million   -.91 Million   -1.01 Million

Initial   Year 1   Year 2   Year 3

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 Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Total costs	($1,265,000)	($1,646,303)	($906,009)	($1,014,905)	($4,832,217)	($4,272,921)
Total benefits	$0	$6,810,592	$7,539,832	$7,602,291	$21,952,716	$18,134,427
Net benefits	($1,265,000)	$5,164,289	$6,633,824	$6,587,386	$17,120,499	$13,861,506
ROI						324%
Payback period (months)						<6 months

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IBM IGNITE Quality And Test: Overview

The following information is provided by IBM. Forrester has not validated any claims and does not endorse IBM or offerings.

IBM IGNITE Quality and Test is an application testing service within IBM Services — designed to improve quality of enterprise applications or a single app through accelerated testing. IBM IGNITE, as a trusted global partner, has the capability in its global, regional, and local delivery centers to engage a scalable Test Delivery and Transformation service which will flex with a client's own changing needs — able to test the latest digital platforms and solutions via a unique open source-based quality platform.

What is IBM IGNITE Quality and Test?

IBM IGNITE helps you move from defect detection to prevention. This offering optimizes the number of tests required, translates and compares scripts to similar tests, then applies AI to test faster and more efficiently. You can improve app quality, get to market faster and save money.

IBM IGNITE leverages AI capabilities via its IGNITE Quality Platform — to put defect prevention front and center of test services, delivering more value with fewer resources. It is a comprehensive set of services that focuses on optimization, automation, and using intelligence to prevent defects from occurring. These services enable Agile and DevOps structures to be effectively deployed and exploited for rapid functional delivery *and* high quality.

The IGNITE Quality Platform (IQP) optimizes test as part of any client transformation or test execution. IGNITE Quality Platform delivers a single quality vision and launchpad for enterprise test optimization, providing automation and AI capabilities based on an enterprise's existing knowledge base and reusable IBM industry assets. It is DevOps enabled and especially useful for demanding test challenges and large application portfolios.
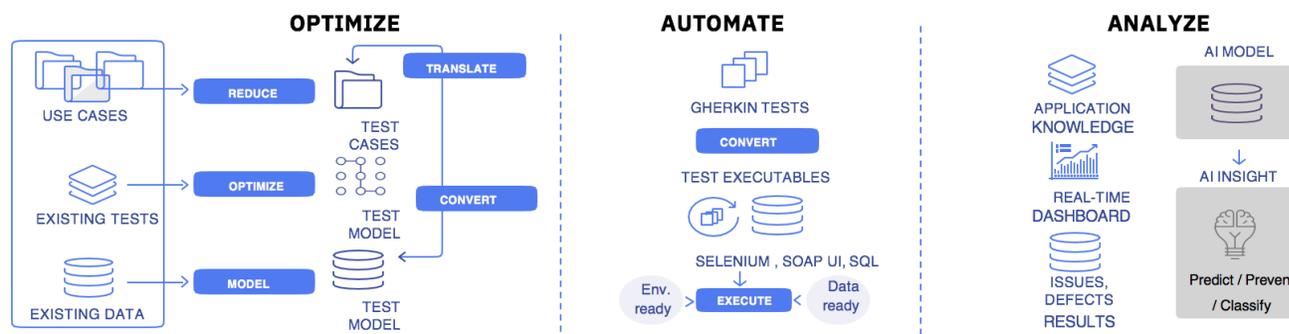

Figure 1: High level components of the IBM IGNITE Quality Platform

Test Delivery and Transform Services. By using the IGNITE Quality Platform our global, regional, and local delivery capability helps reduce testing workload and deliver on business outcomes faster. Our IGNITE delivery capability applies Test Optimization and AI Testing and can deliver higher value with fewer resources. These services include consulting, test optimization, AI testing, and specialized testing such as package, security, data, agile, analytics, infrastructure, performance, mobile, and cloud testing. Other options include TCOE, lifecycle testing, service virtualization, functional testing, and test environment and data management.

Test Optimization Services within the IGNITE Quality Platform utilizes an open source automation engine with mobile and web capability to help accelerate business outcomes. Test Optimization provides integrated document analysis and mining, support for API and virtualization testing, and mobile automation extensions. These services also take advantage of patented technology to help minimize test cases and improve test effectiveness.

AI/Cognitive Testing Services. Consisting of cloud-enabled methods, apps, and predictive functions delivered from within the IGNITE Quality Platform, this service leverages AI to reduce test time from weeks to minutes. Intended for medium and large enterprises, the service offers clients a first-to-market advantage by leveraging natural language and deep analytics to understand what testing is actually needed.

Enterprise Application Testing Services. Offering API enablement and custom enhancements, this service has a transformative effect for the maintenance and enhancement of enterprise systems. Clients can manage the impact of frequent changes across complex systems, with end-to-end testing services minimizing the risk of business disruption.

For more information: https://www.ibm.com/services/applications/testing

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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.

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Appendix B: Endnotes

[1] Source: "The Path To Autonomous Testing: Augment Human Testers First," Forrester Research, Inc., January 7, 2019.

[2] Source: "What Does It Cost To Source A Mobile App?" Forrester Research, Inc., December 8, 2015.

[3] Source: Forrester Analytics Global Business Technographics Developer Survey, 2018.

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