

A Forrester Total Economic
Impact™ Study
Commissioned By
IBM

Project Director:
Adrienne Capaldo
November 2016

The Total Economic Impact™ of IBM Customer Behavior Analytics Solutions

A Cost Savings and Business Benefits
Analysis

FORRESTER®

Table Of Contents

Executive Summary	3
Disclosures	5
TEI Framework and Methodology	6
Analysis	7
Financial Summary	23
IBM Customer Behavior Analytics: Overview	24
Appendix A: Total Economic Impact™ Overview.....	25
Appendix B: Glossary.....	26
Appendix C: Endnotes.....	26

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.

© 2016, Forrester Research, Inc. All rights reserved. Unauthorized reproduction is strictly prohibited. Information is based on best available resources. Opinions reflect judgment at the time and are subject to change. Forrester®, Technographics®, Forrester Wave, RoleView, TechRadar, and Total Economic Impact are trademarks of Forrester Research, Inc. All other trademarks are the property of their respective companies. For additional information, go to www.forrester.com.



Executive Summary

Organizations are under a great amount of stress to deliver outstanding omnichannel interactions to their customers. Creating a positive customer experience in a mobile app or online is at the core of increasing future revenues, improving customer satisfaction, and maintaining strong customer relationships to retain loyal customers. Perhaps more importantly, customer expectations for web and mobile experience are at an all-time high. With so many options available to customers, it is integral to an organization's success that it delivers strong customer experiences.

To deliver these exceptional customer interactions, organizations must pay close attention to their web and mobile design and usability. To better understand this, organizations need a way to have visibility into their customers' online and mobile experiences. Companies must be able to quickly gather and analyze data across channels in a way that allows them to pull and act on valuable, data-backed insights to optimize their channels. This means organizations are in need of a solution that will help them understand their customers' experiences across channels, and ultimately help organizations transform their digital channels for superior design and customer experience.

IBM commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by investing in IBM's customer behavior analytics solutions, which include a software-as-a-service (SaaS) solution, IBM Watson Customer Experience Analytics, and an on-premise solution, IBM Tealeaf CX. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of these customer behavior analytics solutions from IBM, which include struggle analytics, session replay, eventing and alerting capabilities. Specifically, the analysis is focused on users of the previously-named IBM Tealeaf Customer Experience on Cloud solution. Tealeaf's core behavior analytics capabilities are now built into IBM Watson Customer Experience Analytics.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed current IBM customer behavior analytics customers and also conducted an online survey of 30 customer behavior analytics users with multiple years' experience using the solution within their organizations. IBM customer behavior analytics provide quantitative and qualitative information necessary to understand customers' experiences on the Web and mobile applications. The solution helps organizations gather information to better understand customer behavior across web and mobile platforms.

IBM'S CUSTOMER BEHAVIOR ANALYTICS SOLUTIONS HELP IMPROVE CUSTOMER EXPERIENCE ACROSS CHANNELS, INCREASING CONVERSION RATES AND IMPROVING CUSTOMER RETENTION

Our interviews, online surveys, and subsequent financial analysis found that a composite organization based on this analysis experienced the risk-adjusted ROI, benefits, and costs shown in Figure 1.¹ The composite organization analysis points to benefits of over \$13.4 million per year versus deployment costs of approximately \$4.5 million, adding up to a net present value (NPV) of over \$8.9 million.

FIGURE 1

Financial Summary Showing Three-Year Risk-Adjusted Results

**ROI:
196%**

**NPV:
\$8.9M**

**Payback period:
4 months**

Source: Forrester Research, Inc.

› **Benefits.** The composite organization experienced the following risk-adjusted benefits that represent those experienced by the interviewed companies:

- **Incremental revenue from increases in online and mobile conversion rates of sales and transactions.** By using IBM's customer behavior analytics solutions to eliminate key issues that led to abandonment of online and mobile transactions, the composite organization increased its conversion rate by 3.6% for online transactions and by 2.5% for mobile transactions. This led to an increase in revenue of over \$13 million over the three years.
- **Incremental revenue resulting from increases in customer retention.** IBM's customer behavior analytics solutions also helped improve the overall online and mobile experience, resulting in a 1.6% increase for online customer retention and a 1.75% increase for mobile customer retention. This results in over \$1.1 million in additional revenue over the three years.
- **Reduction in time spent on reproduction of online and mobile issues.** IBM's customer behavior analytics solutions increased the ease with which online and mobile issues were reproduced, reducing the reproduction time by 90% by Year 3 for online issues and by 70% for mobile issues. This led to almost \$1.3 million in saved time over the three years.
- **Cost savings from development prioritization.** The composite organization used the data produced by IBM's customer behavior analytics solutions to better understand the impact of online and mobile issues on its customers, and it was able to better prioritize its development efforts to focus on only the most beneficial issues. This led to a savings of over \$350,000 over the three years.
- **Cost savings from SaaS deployment.** The composite organization chose Watson Customer Experience Analytics, a SaaS solution, avoiding costs associated with servers, storage, and maintenance, as well as avoiding labor costs for deploying and maintaining an on-premises environment. Over the three years, this saves the composite organization approximately \$375,300.

› **Costs.** The composite organization experienced the following risk-adjusted costs:

- **Cloud licensing fees, professional services, and training costs.** These are fees paid to IBM for the use of Watson Customer Experience Analytics. In addition, it covers costs paid to IBM's professional services team for support on planning, implementing, and deploying Watson Customer Experience Analytics. This also includes the cost associated with training administrators who manage the system. The composite organization also leverages professional services to effectively train staff to get the most from Watson Customer Experience Analytics.
- **Implementation and planning costs.** These are the internal costs associated with the planning, implementation, and deployment of Watson Customer Experience Analytics.
- **Incremental customer experience staff.** The composite organization has several members of the customer experience staff serving as the champions of Watson Customer Experience Analytics, spending part of their time working with the data to help other members of the team make improvements to the online and mobile channels. In Year 1, this works out to the equivalent of one full-time employee (FTE), and in subsequent years, it works out to the equivalent of two FTEs.
- **Incremental IT administration support staff.** To support the deployment of Watson Customer Experience Analytics, the composite organization would require about 15% of one FTE's time.
- **Additional network bandwidth.** While the composite organization saves money on servers, storage, and maintenance associated with an on-premises deployment, to support the Watson Customer Experience Analytics deployment the organization incurs costs associated with additional network bandwidth.

Disclosures

The reader should be aware of the following:

- › The 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 Watson Customer Experience Analytics or Tealeaf CX.
- › 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.

TEI Framework and Methodology

INTRODUCTION

From the information provided in the interviews and online surveys, Forrester has constructed a Total Economic Impact (TEI) framework for those organizations considering implementing Watson Customer Experience Analytics or Tealeaf CX. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision, to help organizations understand how to take advantage of specific benefits, reduce costs, and improve the overall business goals of winning, serving, and retaining customers.

APPROACH AND METHODOLOGY

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

- › Interviewed IBM marketing, sales, and/or consulting personnel, along with Forrester analysts, to gather data relative to customer behavior analytics and the marketplace for customer behavior analytics.
- › Interviewed existing IBM customer behavior analytics users and surveyed 30 organizations currently using IBM customer behavior analytics to obtain data with respect to costs, benefits, and risks.
- › Designed a composite organization based on characteristics of the interviewed organizations.
- › Constructed a financial model representative of the survey data using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews and surveys as applied to the composite organization.
- › Risk-adjusted the financial model based on issues and concerns the surveyed and interviewed organizations highlighted. Risk adjustment is a key part of the TEI methodology. While interviewed organizations provided cost and benefit estimates, some categories included a broad range of responses or had a number of outside forces that might have affected the results. For that reason, some cost and benefit totals have been risk-adjusted and are detailed in each relevant section.

Forrester employed four fundamental elements of TEI in modeling IBM's customer behavior analytics service: benefits, costs, flexibility, and risks.

Given the increasing sophistication 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 B for additional information on the TEI methodology.

FIGURE 2
TEI Approach



Source: Forrester Research, Inc.

Analysis

COMPOSITE ORGANIZATION

For this study, Forrester conducted interviews and an online survey of 30 organizations in the US that have deployed one of IBM's customer behavior analytics solutions. Online survey participants included line-of-business and IT professionals who make, influence, or have knowledge around decisions related to customer experience technology. While a wide variety of industries were represented, most respondents were from retail organizations. Other industries included financial services, insurance, hospitality, and other services.

Based on the interviews and online surveys, 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 an organization with the following characteristics:

- › It is a US-based retail organization with an international presence with annual revenues of \$1.1 billion, with a strong online and mobile presence, as well as brick-and-mortar locations in the US.
- › The organization has about 120,000 daily visitors to its online sites (which equates to 43.8 million annual visitors), and 82,500 daily visitors (which equates to 30.1 million visitors per year) to its mobile platforms.
- › Prior to implementing an IBM customer behavior analytics solution, the customer experience group struggled to fully understand the numerous challenges that its state-of-the-art website presents. It was unable to easily reproduce reported issues to identify the problem and prioritize its impact on site visitors. With the maturation of its digital and mobile business, the composite company is now focused on optimizing its conversion rate and is committed to improving the customer experience to increase revenues.
- › A vice president of customer experience wants to find a solution to: 1) improve the conversion rate of online and mobile customers; 2) assist technology staff in clearly identifying problems and their resolutions; 3) retain customers so they buy again; and 4) optimize the cross-channel experience for customers.
- › After a request for proposal (RFP) process, the composite organization selected IBM's customer behavior analytics solution. The composite organization implemented Watson Customer Experience Analytics. It worked with the professional services team at IBM to implement its program. The organization now has 100 million events per month captured by its Watson Customer Experience Analytics solution.

It is important to note that while this composite focuses on a retail organization, Forrester spoke with a variety of organizations, including financial services, insurance, and hospitality organizations, as well as retail. The purpose of this document is to build out a framework that an organization can use to determine its potential ROI, regardless of industry.

INTERVIEW HIGHLIGHTS

The interviews and surveys uncovered the following drivers and impacts behind the need for IBM's solution:

- › **Organizations need to improve the cross-channel experience of their customers.** Each organization we spoke with and surveyed understood that it is operating in an environment with increased customer attention across channels. Whether in an online or mobile platform, organizations are seeing higher levels of interactions across their channels. As we heard from one interviewee regarding their mobile platform: "We've seen tremendous adoption of our mobile channels. The amount of time they spend using mobile sites or apps has increased dramatically. We are now interacting with our customers a lot more frequently than we would have through more traditional channels, even some of the digital channels." With this increase in demand comes an increase in competition. In order to stay competitive, these organizations are looking for ways to optimize their mobile and web channels in order to improve their overall customer experience. These organizations know that their customers have come to expect top-notch customer experiences and will move on to another

organization if they are unable to get what they need. Providing exceptional online and mobile experiences is key to winning and retaining customers.

- › **To meet the needs of the customer, organizations are looking for solutions that help them to better understand the current customer experience and identify where customers struggle.** To create an optimized experience, the organizations we spoke with highlighted the fact that they needed to fully understand how users interact with, and more so struggle with, their websites and mobile applications. Both our interviewees and survey respondents discussed the need to gain visibility into how their customers were using their web and mobile channels, and to see where and how they struggled in context. One organization said: “We wanted to better understand our client experience — so what struggles our clients were seeing in the system, what we could learn, what we could measure . . . and then how can we make those experiences the most interactions, more efficient, easier, more intuitive?” As another organization told us, “We use it as a way to understand the behavior, to see if there are opportunities for us to improve the way we have implemented certain features.”
- › **Companies are looking at the long-term impact of improved customer experience.** The companies we spoke with want to not only discover key quick-fixes but also gain insights into higher-level trends to create continuous customer experience improvements. Make no mistake, these organizations are seeing immediate impacts from IBM customer behavior analytics. Many organizations note that their initial adoption of the solution was based on the ability of the product to help them generate big wins by quickly diagnosing conversion and customer experience issues within the first year. As we heard from one organization, “Right at the beginning, we did a lot of quick hits and got a ton of success out of it.” It noted, “Within three months, we had recovered the costs of [the solution] just with a couple big wins.” However, smart companies know they need to have a better, deeper understanding of why their customers are succeeding or failing so they can take action to address the customer experience issues before they become a larger problem. Companies want a solution that helps them make continuous customer experience improvements to grow and retain their customer loyalty.

Our interviews uncovered that IBM customer behavior analytics solutions were selected not only because they helped the organization with the above, but because they:

- › **Provide instant visibility into how users interact with mobile and web channels.** Our interviewees told us that they were impressed with the level of visibility the solution created into their different sites and apps.
- › **Bring instant credibility to issues.** Watson Customer Experience Analytics provides the ability to pinpoint the exact reason a customer struggled or abandoned a transaction. One company noted, “The proliferation of browsers around the world is something that websites deal with; even if you have quality people monitoring things, you might not be able to reproduce it because you’re using the wrong browser.” Another noted: “There’s so much power in presenting to other people and being able to show them what happened instead of trying to tell them. People will take a bigger stand on your behalf if they’ve seen it themselves.” Watson Customer Experience Analytics enables organizations to see firsthand the various issues their clients are experiencing; it builds credibility to issues that were otherwise not seen with existing tools, and it enables teams to create a business case to handle online or mobile obstacles. With this level of granular detail that shows the exact issue and how the customer experienced it, organizations have reported drastically improved internal communication and relationships between technical and business colleagues.
- › **Allow for prioritization of issues to maximize benefits, by helping organizations understand the extent of an issue and how many users are affected.** As we heard from one financial services organization, “Instead of making assumptions about what the users were doing in the system, which really set our product development backlog quite a bit, we’re able to focus more of our development dollars on things that matter to our users without having to kind of just really guess on priority on a lot of cases.” In addition, organizations cited that IBM’s customer behavior analytics solutions bring credibility to issues by pinpointing the reason for customer experience issues or failed transactions.
- › **Create alerts that allow users to proactively monitor the site.** Watson Customer Experience Analytics enables organizations to create events to proactively look for specific error messages and/or report if there is an increase above a

threshold in those messages. As one company noted: “We built events around every error that could occur on any page. If we got a really high number, we’d be able to go directly to it to figure out what was wrong.” Interviewed organizations reported that these alerts can proactively help convert abandoned transactions. “Proactive monitoring capabilities are where IBM has really earned its keep. To be able to determine that someone is having a problem and be able to call them before they call us has been our goal.”

- › **Offer both on-premises and SaaS deployments, based on an organization’s needs.** Over half of our surveyed organizations chose to deploy IBM customer behavior analytics using its SaaS model. These organizations chose this deployment model in order to keep entry costs low, which helped them reduce their total cost of ownership. In addition, organizations cited that the SaaS deployment required less time to implement and maintain and was easy to set up. Organizations with strict regulations, such as financial services organizations, highlighted the benefit of having the option for an on-premises solution: “Because we’re in financial services, we are held to a set of standards and need to make sure that our data is in no way available outside of our organization. That’s why we went with an on-premises deployment.”
- › **Provide key features that create actionable insights.** The analytics, alerts, and dashboards features create actionable insights for organizations. This helps to improve the overall customer experience, creating a more satisfactory experience for users and ultimately improving the organization’s bottom line. In addition, users reported that IBM customer behavior analytics solutions provide additional functionality through their SaaS deployment, such as DOM capture and replay, that meets the needs of some organizations better than the on-premises deployment.

BENEFITS

The composite organization experienced a number of quantified benefits in this case study:

- › Incremental revenue from increased conversion rate.
- › Incremental revenue from improved customer retention.
- › Time saved in reproduction of issues.
- › Cost savings from development prioritization.
- › Cost savings from SaaS deployment.



Incremental Revenue From Increased Conversion Rate

A key benefit experienced by the composite organization was the improvement in the conversion rate of both online and mobile sales and transactions. Our composite organization used the data gathered with Watson Customer Experience Analytics to better understand the customer experience of its online and mobile users. The composite organization was able to gain visibility into each customer's actual web or mobile interaction, and learn about key issues that led to the abandonment of a transaction. These issues may include adding an item to the cart, completing the checkout steps, or entering account information. In addition, the composite organization was able to understand and address these issues and reduce customer abandonment rates, ultimately capturing more sales.

Interviewed organizations noted that IBM's product is unique in that it finds issues that they found difficult or impossible to reproduce on their own. One interviewee said that with the implementation of Watson Customer Experience Analytics, "Every year, we get \$35 million to \$40 million in revenue by fixing issues." For example, organizations leveraged the usability analytics capabilities to gain a better understanding of exactly how their customers were interacting with the site. These capabilities enable organizations to capture, segment, and visualize customer behavior across their online and mobile sites to better understand design and usability concerns. With the mobile analytics capabilities, the organizations were able to reproduce the exact mechanics of the mobile interaction, including how users directly interacted with the device, such as tapping, swiping, pinching, zooming, scrolling, and rotating the device, as well as responsive and unresponsive gestures. The mobile analytics capabilities also captured key mobile attributes, such as device manufacturer, operating system, browser type, and screen resolution. The composite organization was able to use this to optimize the mobile experience by eliminating key obstacles and ultimately capture more sales.

The composite organization has 120,000 daily visitors to its online sites, or 43.8 million visitors per year. Its average online order value is \$400. While conversion rates vary from industry to industry, Forrester applied industry knowledge and information gathered from surveys to determine an online conversion rate of 4% prior to the composite organization implementing IBM's solution.

Over a three-year period, the composite organization used the analyses and alerts from the solution to increase its online conversion rate. As the organization became more comfortable analyzing the data from Watson Customer Experience Analytics and began to use the data to improve the online experience, it increased the conversion rate from 3.25% in Year 1 to 3.45% in the second year, and finally up to 3.6% by Year 3.

Forrester also looked at the organization's mobile usage. The composite organization has 82,500 daily mobile visitors, or 30.2 million mobile visitors per year. The average order value for a mobile transaction is \$200. Again, while mobile conversion rates vary from industry to industry, Forrester determined a mobile conversion rate of 2.75% prior to implementing IBM's customer behavior analytics solution, based on industry knowledge and survey data.

As we saw with the online solution, as the organization became more comfortable using the mobile analytics capabilities, it was able to increase its mobile conversion rate by 2.5% by the third year of the analysis period.

Table 1 shows this benefit in each of the three years of analysis. Note that Forrester used a conservative calculation in this study; the calculation does not take into account growth in the total number of visitors or an increase in order value. The gross margin of 20% is used in this study to calculate the profit that accrues to the company. The incremental revenue realized by the composite organization is similar to the incremental revenue expressed by the companies Forrester spoke with and surveyed.

The interviewed and surveyed organizations provided a range of responses when thinking about the increased conversion rate, average order value, and number of visitors. To compensate for this range, this benefit was risk-adjusted and reduced by 20%. The risk-adjusted total benefit resulting from the incremental revenue from an increased conversion rate of mobile sales and transactions over the three years was \$13,139,124. See the section on Risks for more details.

TABLE 1
Incremental Revenue from Increased Conversion Rate

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
A1	Annual number of online visitors	$120,000/\text{day} * 365$ days	43,800,000	43,800,000	43,800,000
A2	Average online order value		\$400	\$400	\$400
A3	Online conversion rate		4%	4%	4%
A4	Increase in online conversion rate		3.25%	3.45%	3.60%
A5	Annual number of mobile visitors	$82,500/\text{day} * 365$ days	30,112,500	30,112,500	30,112,500
A6	Average mobile order value		\$200	\$200	\$200
A7	Mobile conversion rate		2.75%	2.75%	2.75%
A8	Increase in mobile conversion rate		1.5%	2.0%	2.5%
A9	Gross margin		20%	20%	20%
At	Incremental revenue from increased conversion rate	$(A1*A2*A3*A4*A9)+(A5*A6*A7*A8*A9)$	\$5,052,056	\$5,497,995	\$5,873,854
	Risk adjustment	↓20%			
Atr	Incremental revenue from increased conversion rate (risk-adjusted)		\$4,041,645	\$4,398,396	\$4,699,083

Source: Forrester Research, Inc.



Incremental Revenue From Improved Customer Retention

As we have seen, IBM's customer behavior analytics solution enabled the composite organization to eliminate many problems that affected the overall customer experience for both its web and mobile sites. The organizations surveyed found that if customers had difficulty utilizing an online or mobile site or a mobile application, they were unlikely to try again, resulting in lost revenues. The composite organization spent its initial months of using Watson Customer Experience Analytics finding and fixing key user experience issues. As the

organization's use matured, it continued to optimize the online and mobile customer experience, leading to more satisfied customers. Satisfied customers are more likely to be repeat users of online sites or mobile apps, and they helped to gradually improve the number of repeat purchasers for the composite organization.

To calculate this benefit, Forrester looked at the number of online and mobile transactions per year. Table 2 shows how this benefit was calculated. Prior to the use of IBM's solution, our composite organization experienced an average online retention rate of 25% and an average mobile retention rate of 18%, similar to that of the interviewed and surveyed organizations.

With customer behavior analytics, the organization was able to improve the retention rate of online users gradually over the three years of the analysis, improving by 1.6%. Similarly, it was able to use customer behavior analytics from IBM to improve the overall mobile experience for users. Due to this, the composite organization was able to improve the retention rate of mobile users, gaining a 1.75% increase by Year 3 of the study.

Different organizations noted different retention and improvement rates; to accommodate for this, the benefit was risk-adjusted and reduced by 15%. Assuming a gross margin of 20%, the three-year risk-adjusted total benefit was \$1,101,305.

TABLE 2
Incremental Revenue from Improved Customer Retention

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
B1	Number of online transactions per year	120,000/day * 4% conversion rate * 365 days	1,752,000	1,752,000	1,752,000
B2	Percent online retention rate		25%	25%	25%
B3	Percentage improvement in online customer retention rate		0.5%	0.9%	1.6%
B4	Average online order value	A2	\$400	\$400	\$400
B5	Number of mobile transactions per year	82,500/day * 2.75% conversion rate * 365 days	828,094	828,094	828,094
B6	Percent mobile retention rate		18%	18%	18%
B7	Percentage improvement in mobile customer retention rate		1.00%	1.35%	1.75%
B8	Average mobile order value	A6	\$200	\$200	\$200
B9	Gross margin	A9	20%	20%	20%
Bt	Incremental revenue from improved customer retention	$(B1*B2*B3*B4*B9)+(B5*B6*B7*B8*B9)$	\$234,823	\$395,851	\$664,980
	Risk adjustment	↓15%			
Btr	Incremental revenue from improved customer retention (risk-adjusted)		\$199,599	\$336,473	\$565,233

Source: Forrester Research, Inc.



Time Saved in Reproduction of Issues

Watson Customer Experience Analytics enabled the composite organization to reproduce and identify online and mobile issues more quickly than before, resulting in significant time savings. Surveyed organizations reported that they often purchased IBM's customer behavior analytics solutions to help their teams investigate

web and mobile incidents, although they now leverage it more strategically to drive incremental revenues. Prior to IBM's solution, the composite organization relied solely on customer descriptions to try and determine an issue, which could take many hours. As we heard from one interviewee, issues now take ". . . as little as 15 minutes to identify; before, it may have taken days to discover and assess an issue." Another organization told us how it had encountered an issue affecting 300,000 of its customers: "Without IBM, it could have taken us anywhere from 40 hours to two years to identify the problem." With IBM Watson Customer Experience Analytics, the composite organization is able to quickly identify and resolve issues.

When considering the impacts on mobile sites and applications, the development team also needed to have the customer explain the type of device, the operating system, and the steps that caused the issue. Often, these organizations had trouble recreating the issue, if they were able to reproduce it at all. With IBM's customer behavior analytics capabilities, the composite organization was able to quickly identify and investigate issues using session recordings, saving time for developers and customers alike. As one interviewee told Forrester, "The ability to quickly find a session, bring it up, and play it back screen by screen, touch by touch, helps us make sure our customers can do what they want on our apps." With the proliferation of devices and operating systems, IBM's solution helped the composite organization quickly identify the issues when helping its mobile customers.

In order to calculate this benefit, Forrester assumes there are 250 online incidents and 300 mobile incidents a year that use customer behavior analytics to help identify the issue. Prior to the implementation of Watson Customer Experience Analytics, the composite organization spent an average of 20 hours to reproduce an online issue and 15 hours to reproduce a mobile issue. Note that while the calculation focuses on the time spent by developers, many of these issues also required the time of the customers. While the customers' time was not directly calculated, it is important to note that IBM's solution ensures that customers do not need to spend their valuable time helping the composite organization reproduce the issue. Using Watson Customer Experience Analytics, by Year 3, the composite organization was able to reduce the time spent to reproduce an online error by 90% and reduce the time spent to reproduce mobile issues by 70%. Table 3 shows how this was calculated. To compensate for variances in hours saved, this benefit was risk-adjusted and reduced by 10%. The risk-adjusted total benefit over the three years was \$1,297,958.

TABLE 3

Time Saved in Reproduction of Issues Using IBM Customer Behavior Analytics Solutions

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
C1	Average number of hours required to reproduce an online issue before implementation		20	20	20
C2	Percent reduction in time to reproduce an online error		80%	85%	90%
C3	Annual number of online incidents that use the solution		250	250	250
C4	Average number of hours required to reproduce a mobile issue before implementation		15	15	15
C5	Percent reduction in time to reproduce a mobile error		60%	65%	70%
C6	Annual number of mobile incidents that use the solution		300	300	300
C7	Hourly rate for developer	\$140,000/ 2,080 working hours a year	\$67	\$67	\$67
Ct	Time saved in reproduction of issues	$(C1 \cdot C2 \cdot C3 \cdot C7) + (C4 \cdot C5 \cdot C6 \cdot C7)$	\$448,900	\$480,725	\$512,550
	Risk adjustment	↓10%			
Ctr	Time saved in reproduction of issues (risk-adjusted)		\$404,010	\$432,653	\$461,295

Source: Forrester Research, Inc.



Savings from Development Prioritization

Interviewed and surveyed organizations highlighted that a key benefit of IBM's solution was how it prioritized development efforts by helping them understand which issues affect the most customers. With IBM's customer behavior analytics capabilities, organizations are better able to identify and understand the extent of a problem to best understand where to focus development resources. In particular, today's mobile environment creates complex issues for development. With the proliferation of devices and operating systems, it is often difficult to have enough visibility into the mobile user landscape to understand where to concentrate. With many organizations feeling the strain of limited, scarce, and expensive development resources, being able to prioritize their time is key.

Prior to using IBM customer behavior analytics solutions, interviewed and surveyed organizations shared how development issues were largely handled ad hoc or treated with the same importance across the board with limited visibility into an issue's impact on customers. This could lead to valuable resources spending time on projects that had little impact on the overall customer experience. Now, with the solution, organizations are able to analyze and prioritize development projects. One customer explained, "Because we don't have enough IT resources or money to fix every problem, IBM gives us the ability to identify, prove, and prioritize problems." Another company agreed: "We can assign priority to projects. We'll go out and see how many people are running into an issue. If it's only 10 people a day, it may get assigned to be fixed in the next month; if it's 10,000 a day, then it gets fixed immediately." The development team is able to use IBM customer behavior analytics capabilities to help them understand if there are specific operating systems, browsers, or mobile devices that are causing issues. The solution helps organizations prioritize development issues, ensuring they address the most

significant issues quickly, and improve the mobile experience for the majority of their customers. This ensures that the development team spends its time wisely, and ultimately saves money.

To calculate this benefit, the model assumes that each year there are 30 potential online projects and 20 potential mobile projects for the development team to work on. In years past, the development team would have worked on each of these projects without a clear picture of the impact or priority of each issue. By using the solution's analysis of the problem and gaining visibility into the size of the issue, the team is able to prioritize the potential projects and focus on 35% of these issues, or only 17 projects. This means the development team avoids taking on 33 projects each year. Assuming that each issue takes 60 hours of development time, and with an assumed salary of \$67 per hour, the savings from development prioritization are \$130,650 each year. However, interviewed organizations did note that the number of projects undertaken or the time spent on each could differ. To take that into consideration, Forrester risk-adjusted and reduced the benefit by 10%, resulting in a three-year risk-adjusted total benefit of \$352,755. Table 4 highlights this calculation.

TABLE 4
Savings from Development Prioritization

Ref.	Metric	Calculation	Each Year
D1	Number of potential online projects		30
D2	Number of potential mobile projects		20
D3	Percent of projects undertaken with customer behavior analytics		35%
D4	Number of projects avoided with prioritization with customer behavior analytics	$(D1+D2)-((D1+D2)*D3)$	33
D5	Average number of developer hours spent on a project	Hours	60
D6	Hourly rate of developers	C7	\$67
Dt	Cost savings from development prioritization	$D4*D5*D6$	\$130,650
	Risk adjustment	↓10%	
Dtr	Cost savings from development prioritization (risk-adjusted)		\$117,585

Source: Forrester Research, Inc.



Cost Savings from SaaS Deployment

Our last benefit looks at the cost savings experienced by the composite organization by selecting a SaaS deployment of Watson Customer Experience Analytics, compared with hosting it on-premises. By moving forward with the cloud deployment, the composite organization avoided a number of upfront hardware costs and the ongoing cost of maintaining the hardware, while also avoiding the labor costs associated with the implementation and maintenance of an on-premises deployment. In order to calculate this benefit, the model assumes that the composite organization eliminated the need for eight servers (estimated to cost about \$10,000 each), as well as \$37,000 in storage costs. In addition, it avoided the ongoing maintenance associated with those servers and storage, eliminating the 20% maintenance fee for each subsequent year. The composite organization also avoided an additional 100 hours of time to implement Watson Customer Experience Analytics and the ongoing labor costs, with 75% of one IT FTE's time focused on maintaining the on-premises environment of the solution. Table 5 shows how this was calculated. Due to variability in the amount of hardware or labor

avoided, Forrester risk-adjusted this benefit and decreased it by 10%. The total risk-adjusted value over three years was \$375,300.

TABLE 5
Cost Savings from SaaS Deployment

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
E1	Eliminated server costs	8 servers at \$10,000	\$80,000			
E2	Eliminated storage costs		\$37,000			
E3	Eliminated server and storage maintenance costs	20%		\$23,400	\$23,400	\$23,400
E4	Avoided cost of IT labor to implement customer behavior analytics	100 hours saved @ \$48/hr.	\$4,800			
E5	Avoided cost of IT labor to maintain on-premises deployment	75% of IT FTE savings @ \$100,000 annual salary		\$75,000	\$75,000	\$75,000
Et	Cost savings from SaaS deployment	E1+E2+E3+E5	\$121,800	\$98,400	\$98,400	\$98,400
	Risk adjustment	↓10%				
Etr	Cost savings from SaaS deployment (risk-adjusted)		\$109,620	\$88,560	\$88,560	\$88,560

Source: Forrester Research, Inc.

THE IMPACT OF THE USABILITY ANALYTICS CAPABILITIES

The usability analytics capabilities provide organizations with clear visibility, at a granular level if needed, into the usability of their online and mobile sites. They provide organizations with valuable analytics and insights into sources of customer struggle. From our survey, Forrester uncovered the following key impacts organizations saw tied to these capabilities:

- **Improved link click rates.** The usability analytics capabilities provided organizations with key metrics about their site links. This helped them better understand how different link placement affected their users and ultimately helped them improve conversion and engagement.
- **Improved accessibility.** Organizations used these capabilities to help them better understand the usability needs of their customers with visual impairments. The analytics provided through this feature allows these organizations to comply with visual guidelines and meet specifications by highlighting any violations and offering recommendations to improve their sites for these users.
- **Improved field completion.** The usability analytics capabilities helped surveyed organizations better understand key details about their form fields, such as where a customer is dropping off, in order to ultimately optimize these forms and increase conversion rates.
- **Improvements to overall usability.** With insights from these usability analytics, organizations were able to make usability improvements to their web and mobile sites, which led to an average time savings for customers of 13%. For an average site visit of 9 minutes, this is about 1.2 minutes saved for the customer.

Total Benefits

Table 6 shows the total of all benefits across the five areas listed above, 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 \$13.4 million.

TABLE 6

Total Benefits (Risk-Adjusted)

Ref.	Benefit Category	Initial	Year 1	Year 2	Year 3	Total	Present Value
Atr	Incremental revenue from increased conversion rate	\$0	\$4,041,645	\$4,398,396	\$4,699,083	\$13,139,124	\$10,839,751
Btr	Incremental revenue from improved customer retention	\$0	\$199,599	\$336,473	\$565,233	\$1,101,305	\$884,199
Ctr	Time saved in reproduction of issues	\$0	\$404,010	\$432,653	\$461,295	\$1,297,958	\$1,071,424
Dtr	Cost savings from development prioritization	\$0	\$117,585	\$117,585	\$117,585	\$352,755	\$292,416
Etr	Cost savings from SaaS deployment	\$109,620	\$88,560	\$88,560	\$88,560	\$375,300	\$329,856
	Total benefits (risk-adjusted)	\$109,620	\$4,851,399	\$5,373,667	\$5,931,756	\$16,266,442	\$13,417,646

Source: Forrester Research, Inc.

COSTS

The composite organization experienced a number of costs associated with Watson Customer Experience Analytics:

- › Cloud licensing, professional services, and training costs.
- › Implementation and planning costs.
- › Incremental customer experience staff.
- › Incremental IT administration support staff.
- › Additional network bandwidth.

These represent the mix of internal and external costs experienced by the composite organization for initial planning, implementation, and ongoing maintenance associated with the solution.



Cloud Licensing, Professional Services, and Training Costs

Our composite organization incurs a yearly fee for its cloud licensing, based on its usage of Watson Customer Experience Analytics. This works out to an annual cost of \$864,240. In addition, the composite organization used IBM to help set up the solution and do initial onboarding. It also provided initial training to IT, customer experience staff, and the customer service organization. The composite organization initially purchased \$104,000 of services that included implementation and onboarding. In the following years, it leveraged the solution as necessary, incurring an additional \$10,000 for years 1 through 3. The composite organization also spent additional dollars internally on initial and new user training during subsequent years as necessary. As Forrester learned through our interviews, the composite organization focused dollars on training, as a thorough understanding of the product is necessary to get the most value from the investment.

Due to the fact that organizations may require different levels of licensing, services, and training, this cost was risk-adjusted up by 10%. The risk-adjusted cost of professional services and training over the three years was \$3,988,556.

TABLE 7

Cloud Licensing, Professional Services, and Training

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
F1	Annual cost of cloud licensing		\$864,240	\$864,240	\$864,240	\$864,240
F2	Professional services		\$104,000	\$10,000	\$10,000	\$10,000
F3	Training costs		\$15,000	\$10,000	\$5,000	\$5,000
Ft	Cloud licensing, professional services, and training costs	F1+F2+F3	\$983,240	\$884,240	\$879,240	\$879,240
	Risk adjustment	↑10%				
Ftr	Cloud licensing, professional services, and training costs (risk-adjusted)		\$1,081,564	\$972,664	\$967,164	\$967,164

Source: Forrester Research, Inc.



Implementation and Planning Costs

Based on feedback from the interviewed and surveyed organizations, Forrester estimates the composite organization will spend 300 man-hours over a two-month period to plan and implement the SaaS deployment of Watson Customer Experience Analytics. This will include team members from IT and the customer experience team. Internal team size will vary based on the organization and size of deployment. To compensate, this cost was risk-adjusted up by 5%. The risk-adjusted present value cost over the three years was \$17,955.

TABLE 8

Implementation And Planning Costs

Ref.	Metric	Calculation	Initial
G1	Man-hours for initial planning and implementation		300
G2	Average blended hourly salary		\$57
Gt	Implementation and planning costs	$G1 \times G2$	\$17,100
	Risk adjustment	↑5%	
Gtr	Implementation and planning costs (risk-adjusted)		\$17,955

Source: Forrester Research, Inc.



Incremental Customer Experience Staff

In Year 1, the composite organization has a key champion within the customer experience group to support Watson Customer Experience Analytics and help the team optimize web and mobile sites and increase conversion rates. This employee is responsible for filtering reported issues to determine their prevalence. The employee then prioritizes the issues based on using the solution to understand the breadth of each issue among visitors to the site. They are responsible for setting up and monitoring alerts and dashboards to understand if new issues arise. As more of the composite organization's employees begin to utilize and demand data from IBM's solution, the team increases to two FTEs supporting Watson Customer Experience Analytics to support the increased adoption across the organization. To compensate for variations in salary and time dedicated to the solution, this cost was risk-adjusted up by 10%. Assuming a fully loaded annual salary of \$140,000, the risk-adjusted cost of the incremental customer experience staff members over the three years was \$770,000.

TABLE 9

Incremental Customer Experience Staff

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
H1	FTE dedicated to supporting the customer behavior analytics solution		1	2	2
H2	Fully loaded annual salary	\$140,000	140,000	140,000	140,000
Ht	Incremental customer experience staff	$H1 \times H2$	\$140,000	\$280,000	\$280,000
	Risk adjustment	↑10%			
Htr	Incremental customer experience staff (risk-adjusted)		\$154,000	\$308,000	\$308,000

Source: Forrester Research, Inc.



Incremental IT Administration Support Staff

The IT team provides minimal administrative support for the Watson Customer Experience Analytics solution, as it is a SaaS deployment. Forrester estimates that the composite organization would require about 15% of one FTE's time to support IBM's solution.

To compensate for salary differences and time spent supporting the solution, this cost was risk-adjusted up by 10%. The risk-adjusted cost of an incremental IT admin over the three years was \$49,500.

TABLE 10
Incremental IT Administration Support Staff

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
I1	Percentage of one IT FTE supporting IBM customer behavior analytics		15%	15%	15%
I2	Annual fully loaded salary		\$100,000	\$100,000	\$100,000
I _t	Incremental IT administration support staff	I1*I2	\$15,000	\$15,000	\$15,000
	Risk adjustment	↑10%			
I _{tr}	Incremental IT administration support staff (risk-adjusted)		\$16,500	\$16,500	\$16,500

Source: Forrester Research, Inc.



Additional Network Bandwidth

Implementing Watson Customer Experience Analytics, a SaaS deployment, required the composite organization to invest in more network bandwidth for internet connectivity to ensure proper performance. How much additional bandwidth is required, if any, will depend on the size of the existing infrastructure. To compensate, this cost was risk-adjusted up by 10%. The risk-adjusted total cost over the three years was \$418,000.

TABLE 11
Additional Network Bandwidth

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
J1	Number of months		2	12	12	12
J2	Cost per month		\$10,000	\$10,000	\$10,000	\$10,000
J _t	Additional network bandwidth	J1*J2	\$20,000	\$120,000	\$120,000	\$120,000
	Risk adjustment	↑10%				
J _{tr}	Additional bandwidth (risk-adjusted)		\$22,000	\$132,000	\$132,000	\$132,000

Source: Forrester Research, Inc.

Total Costs

Table 12 shows the total of all costs as well as associated present values, discounted at 10%. Over three years, the composite organization expects costs to total a net present value of a little more than \$4.5 million.

TABLE 12
Total Costs (Risk-Adjusted)

Ref.	Cost Category	Initial	Year 1	Year 2	Year 3	Total	Present Value
Ftr	Cloud licensing, professional services, and training costs	\$1,081,564	\$972,664	\$967,164	\$967,164	\$3,988,556	\$3,491,758
Gtr	Implementation and planning costs	\$17,955	\$0	\$0	\$0	\$17,955	\$17,955
Htr	Incremental customer experience staff	\$0	\$154,000	\$308,000	\$308,000	\$770,000	\$625,950
Itr	Incremental IT administration support staff	\$0	\$16,500	\$16,500	\$16,500	\$49,500	\$41,033
Jtr	Additional network bandwidth	\$22,000	\$132,000	\$132,000	\$132,000	\$418,000	\$350,264
Total costs (risk-adjusted)		\$1,121,519	\$1,275,164	\$1,423,664	\$1,423,664	\$5,244,011	\$4,526,961

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 Watson Customer Experience Analytics and later realize additional uses and business opportunities. Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix A).

RISKS

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 an IBM customer behavior analytics solution 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 IBM’s solution, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

TABLE 13

Benefit and Cost Risk Adjustments

Benefits	Adjustment
Incremental revenue from increased conversion rate	↓ 20%
Incremental revenue from improved customer retention	↓ 15%
Time saved in reproduction of issues	↓ 10%
Cost savings from development prioritization	↓ 10%
Cost savings from SaaS deployment	↓ 10%
Costs	Adjustment
Cloud licensing, professional services, and training costs	↑ 10%
Implementation and planning costs	↑ 5%
Incremental customer experience staff	↑ 10%
Incremental IT administration support staff	↑ 10%
Additional network bandwidth	↑ 10%

Source: Forrester Research, Inc.

Quantitatively capturing implementation risk and impact risk by directly adjusting the financial estimates results provides 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 impact risk that affects benefits is identified as part of the analysis:

- › Adoption risk is a risk that can greatly affect benefits. Employee use and buy-in are the keys to realizing the full benefits mentioned in this study. Interviewed organizations noted that when IBM customer behavior analytics solutions were used not just as a means to identify and fix issues, but as a larger part of a strategic focus on optimizing the overall customer experience, they realized more value from their investment.

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

- › The cost of professional services or level of training may be higher than originally anticipated.
- › Bandwidth requirements may be greater than initially anticipated.

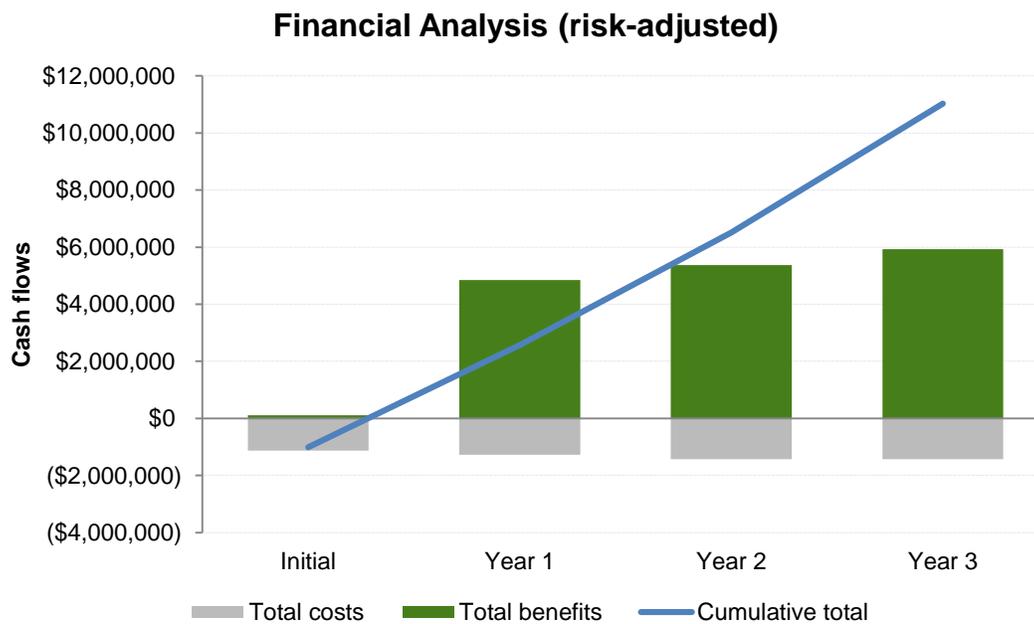
Table 13 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates for the composite organization. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Financial Summary

The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment in IBM's solution.

Table 14 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 13 in the Risks section to the unadjusted results in each relevant cost and benefit section.

FIGURE 3
Cash Flow Chart (Risk-Adjusted)



Source: Forrester Research, Inc.

TABLE 14
Cash Flow (Risk-Adjusted)

Summary	Initial	Year 1	Year 2	Year 3	Total	Present Value
Total costs	(\$1,121,519)	(\$1,275,164)	(\$1,423,664)	(\$1,423,664)	(\$5,244,011)	(\$4,526,961)
Total benefits	\$109,620	\$4,851,399	\$5,373,667	\$5,931,756	\$16,266,442	\$13,417,646
Total	(\$1,011,899)	\$3,576,235	\$3,950,003	\$4,508,092	\$11,022,431	\$8,890,685
ROI						196%
Payback period (months)						4

Source: Forrester Research, Inc.

IBM Customer Behavior Analytics: Overview

The following information is provided by IBM. Forrester has not validated any claims and does not endorse Watson Customer Experience Analytics, Tealeaf CX or other IBM offerings.

IBM customer behavior analytics solutions help companies improve the online customer experience by providing both quantitative and qualitative information necessary to understand customers' true experiences on the Web and mobile applications. These solutions can be used in cloud or on-premises environments to provide companies with essential information for conducting online customer behavior analysis. The solution also includes usability analytics to strengthen the understanding of user intent through highly visual and analytic site overlays.

› Customer behavior analytics:

- › Use customer experience analytics to transform the rich customer experience data set captured by the platform in near real time into visually replayable and searchable customer sessions.
- › Enable proactive management by providing an early warning system that identifies significant changes in critical customer experience metrics, struggle scores, and key performance indicators (KPIs).

› **Usability analytics.** Help analyze and understand user intention across digital interaction points, such as web and mobile. Teams throughout the enterprise will be able to collaborate and quantify customer behavior data and turn it into real business insight.

› **Mobile analytics.** Enable companies to apply IBM's customer behavior analytics to their mobile websites, native applications, and hybrid applications, including support for HTML5 and responsive web design (RWD). Mobile analytics provides visibility into the mobile customer experience, helping to deliver more successful mobile products and services.

Appendix A: 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. TEI assists technology vendors in winning, serving, and retaining customers.

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

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.

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. However, having the ability to capture that benefit has a PV that can be estimated. The flexibility component of TEI captures that value.

RISKS

Risks measure 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 risk factors are based on a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the risk factor around each cost and benefit.

Appendix B: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Companies set their own 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 organizations 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 NPV of cash flows.

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.

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 at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations are not calculated until 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.

Appendix C: 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, see the section on Risks.