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The Total Economic Impact™ Of Using ThoughtWorks' Agile Development Approach

Single Company Analysis — Media

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Executive Summary

In March 2008, ThoughtWorks, Inc. commissioned Forrester Research, Inc. to examine the financial impact and potential return on investment (ROI) an enterprise might realize by engaging with ThoughtWorks for a software development project using ThoughtWorks' Agile development approach. In order to determine the impact, Forrester examined the specific costs, benefits, flexibility and risk elements a ThoughtWorks customer realized as a result of its investment.

In conducting in-depth interviews with a ThoughtWorks customer, Forrester found that this company achieved:

1. **Cost savings.** Higher quality and more efficient development led to reduction in overall project time, defects and rework. This resulted in reduced costs to build, change and support the new platform. In total, the customer avoided £987,520 in costs over a five year period.
2. **Faster time-to-benefits.** ThoughtWork's Agile methodology enabled the reference organization to reprioritize tasks throughout the project. Significant changes in scope were embraced by the project. The ThoughtWorks approach, therefore, delivered key business requirements — and thus benefits — sooner.

Purpose

The purpose of this report is to provide readers with a framework to evaluate the potential financial impact of engaging with ThoughtWorks for projects using the Agile development approach within their own environment. Forrester's aim is to clearly show all calculations and assumptions that go into the analysis. This study should be seen as a guide to better understand and evaluate ThoughtWorks and its Agile development methodology to determine whether it is a worthwhile investment.

Methodology

ThoughtWorks selected Forrester for this project because of its industry expertise in Agile development and Forrester's Total Economic Impact™ (TEI) methodology. TEI not only measures costs and cost reduction (areas that are typically accounted for within IT) but also weighs the enabling value of a technology in increasing the effectiveness of overall business processes.

For this study, Forrester employed four fundamental elements of TEI in modeling ThoughtWorks Agile development:

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

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

Approach

Forrester used a four-step approach for this study:

1. Forrester gathered data from existing Forrester research relative to ThoughtWorks and Agile development in general.
2. Forrester interviewed ThoughtWorks personnel to fully understand the potential (or intended) value proposition of working with ThoughtWorks.
3. Forrester conducted a series of in-depth interviews with the organization that is the subject of this study.
4. Forrester constructed a financial model representative of the interviews. This model can be found in the TEI Framework section below.

Key Findings

Forrester's study yielded three key findings:

- **ROI.** Based on the interviews with ThoughtWorks' existing customer, Forrester constructed a TEI framework and the associated ROI analysis illustrating the financial impact areas. As seen in Table 1, the ROI for the reference organization is 40%.
- **Benefits.** Higher quality and more efficient development led to a reduction in overall project duration, defects and rework. This resulted in reduced costs to build, change and support a new development and production platform. The ThoughtWorks Agile approach also enabled significant changes in scope to be embraced by the project. The reference organization estimated that a Waterfall development approach using another third party developer would have resulted in 40% higher costs than the ThoughtWorks' Agile approach.
- **Costs.** The cost to develop the new platform includes the ThoughtWorks development costs. The risk-adjusted costs used to calculate the ROI are £1,785,000.

Table 1 illustrates the risk-adjusted cash flow for the reference organization, based on data and characteristics obtained during the interview process. Forrester risk-adjusts these values to take into account the potential uncertainty that exists in estimating the costs and benefits of a technology investment. The risk-adjusted value is meant to provide a conservative estimation, incorporating any potential risk factors that may later impact the original cost and benefit estimates. For a more in-depth explanation of risk and risk adjustments used in this study, please see the "Risk" section.

Table 1: Composite Company ROI, Risk-Adjusted

Ref.	Total benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total	NPV
R1	Total costs		£1,785,000						£1,622,728
R2	Total benefits		£836,928	£218,160	£190,148	£12,960	£12,960	£1,271,156	£1,100,901
R3	Flexibility								£1,174,502
R4	Total	R2 + R3							£2,275,403
R5	Return on investment	R4 / R1							40%

Source: Forrester Research, Inc.

Disclosures

The reader should be aware of the following:

- The study is commissioned by ThoughtWorks and delivered by the Forrester Consulting group.
- ThoughtWorks reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester’s findings or obscure the meaning of the study.
- The customer names for the interviews were provided by ThoughtWorks.
- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in ThoughtWorks Agile development.
- This study is not meant to be used as a competitive product analysis.

ThoughtWorks Agile Development: Overview

ThoughtWorks has invested heavily in a consistent methodology for software development and project management, based largely on agile development techniques. All consultants are trained in the methodology and share best practices across engagements. ThoughtWorks' overall goals with this methodology are to reduce project risk by enabling visibility into the development process and responsiveness to evolving requirements, and to deliver high quality software in less time and using fewer resources.

Some of the key components of the ThoughtWorks methodology are:

- **Short cycles.** Deliver working code to the business users in regular, short iterations (two to four weeks), ensuring quick feedback and quality assurance and reducing inaccurate status reporting.
- **Test-first development.** Building test cases and scripts as requirements are defined, prior to developing code.
- **Continuous integration.** Rebuilding and automatically testing the code base after every code change, to address issues immediately and support distributed parallel development.
- **Refactoring.** Improving upon the design of existing code, to support new requirements and/or improve existing capability.
- **Empowered team.** Allowing developers, analysts and testers to “own” the project and work directly with business representatives to prioritize key requirements and resolve issues.
- **Reduction of project risk.** Reducing the likelihood of late delivery by driving close collaboration with the business, ensuring that the key project risks are identified and mitigated at the start of the project

Analysis

Interview Highlights

In discussions with the reference organization, several key drivers of benefits were uncovered:

- The quality of the ThoughtWorks staff and their ability to handle difficult projects drove efficiency within the organization, potentially reducing the defects and rework down the road that is often associated with complex projects. This resulted in reduced costs to build, change and support a new development and production platform.
- The reference organization estimated that a Waterfall development approach using another third party developer would have resulted in 40% higher costs than the ThoughtWorks' Agile approach.
- ThoughtWorks' Agile practices, requiring close communication between IT and business stakeholders, delivered key business requirements — and thus benefits — sooner. Business users had control from the start of the project, ensuring that key business requirements would be met. The organization noted that prioritizing benefits upfront was a key component in seeing the value of ThoughtWorks' approach.
- The Agile methodology also enabled the reference organization to reprioritize tasks throughout the project. Significant changes in scope were embraced by the project enabling the project to keep pace with business change and ensure relevancy throughout the lifecycle of the project.
- The organization was using Agile development in some areas. The client hoped that it could further leverage ThoughtWorks' experiences on future internal development efforts and benefit from knowledge transfer to internal staff throughout the project.
- For the organization, the alternative to engaging with ThoughtWorks was to leverage traditional Waterfall development with the help of a third party consultancy.



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TEI Framework

Introduction

From the information provided in the in-depth interviews, Forrester has constructed a TEI framework for organizations considering implementation of Agile development. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that impact the investment decision.

This section illustrates a sample ROI analysis for the reference organization. This model was created as a result of discussions with the organization to determine the underlying costs and benefits of engaging with ThoughtWorks for an Agile software delivery project. Data contained within this model is based on information received from each of the interview participants and represents preliminary interview findings. Since this model examines just one customer, data and the financial ROI should not be seen as validation of the potential return that a given organization may achieve from the use of ThoughtWorks. Organizations must use their own data to determine their own potential return.

Description of the Reference Organization

The organization had the following characteristics:

- The organization is the online presence for an international news organization.
- The project involved the creation of a new development and production environment coupled with a site redesign.
- An integrated workflow for the creation and publication of online content was created.
- Keyword-based advertising models with associated dynamic page builds and flexible advertising formats were enabled for the commercial teams.
- The first phase of the project involved the lightweight architectural design, and the creation of a development and production platform a subset of online content. This pilot site was launched 9 months after project commencement. At the time of publication, 65% of content is live on the new platform, including the main News site and the majority of the remaining content is due to be launched by the end of 2008.
- The option of purchasing a packaged solution was rejected early in the decision making process because of the requirement for greater flexibility and control.
- The organization had a choice whether to develop the solution in-house relying in part on a traditional consultancy for development support or to have ThoughtWorks take on a comparable amount of the development work.
- The organization also saw the engagement with ThoughtWorks as a test of the Agile methodology. If successful, components of the Agile methodologies would be applied on subsequent internally driven application development projects as enabled by transfer of knowledge from ThoughtWorks to client staff during the project.
- The project would be measured on a five-year investment life cycle.

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Based on these assumptions, it is possible to construct a financial model that examines the costs and benefits of moving forward with a ThoughtWorks solution.

Framework Assumptions

Table 2 lists the discount rate used in the PV and NPV calculations and time horizon used for the financial modeling.

Table 2: General Assumptions

Ref.	General assumptions	Value
A1	Discount rate	10%
A2	Length of analysis	Five Years

Source: Forrester Research, Inc.

Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with Finance to determine the most appropriate discount rate to use within their own organizations.

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used within this analysis.

Table 3: Salary Assumptions

Ref.	Metric	Value
B1	Hours per week	40
B2	Weeks per year	52
B3	Hours per year (M-F, 9-5)	2,080
B4	Hours per year (24x7)	8,736
B5	Application Support Team burdened annual salary	£60,000
B6	Online Content Editor burdened annual salary	£60,000

Source: Forrester Research, Inc.

Costs

The cost of ThoughtWorks’ consulting fees is included in the overall cost of development. Thus, it is necessary to first describe the specific cost structure around the individual project. The cost of development over a five year period is estimated to be £2,468,800. This includes the cost of internal and external staff and support.

The ThoughtWorks cost component was estimated to be 70% of the overall cost of development. This includes the billable cost of ThoughtWorks staff as well as the indirect costs of planning for and managing the ThoughtWorks relationship.

Table 4 illustrates the ThoughtWorks and non-ThoughtWorks cost components of the project. We assume a 10% yearly discount rate on the cost of capital for the reference organization.

Table 4: Development Costs, Nonrisk-Adjusted

Ref.	Project costs	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
C1	ThoughtWorks Development Costs		£1,700,000					£1,700,000
C2	Internal Development Costs		£624,800					£624,800
C3	Support Costs			£36,000	£36,000	£36,000	£36,000	£144,000
C4	Total Costs	C1+C2+C3	£2,324,800	£36,000	£36,000	£36,000	£36,000	£2,468,800

Source: Forrester Research, Inc.

Benefits

In speaking with the reference organization, Forrester discovered several benefits to ThoughtWork’s Agile approach within the organization’s environment.

First, this approach contributed to efficiency within the reference organization’s IT group by minimizing the potential that unforeseen changes or errors would increase the overall project cost. In addition, critical functionality was moved to significantly earlier in the project which had the effect of increasing the speed with which organizational benefits were achieved. This second benefit can potentially impact areas outside of IT since benefits attributable to the entire organization will be realized sooner.

More Efficient Development

The efficiency created by the use of ThoughtWork’s Agile approach resulted in lower overall cost due in part to less rework during the development process. This reduced the amount of downstream changes and development errors compared to the alternative — Waterfall development.

The main source of efficiency savings was from the reference organization’s increased ability to absorb changes in scope compared to a traditional change control programme. The environment created by ThoughtWorks enabled significant unplanned changes in scope to be embraced within

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the original project budget. The reference organization believed that a Waterfall development approach using another third party developer would have been less able to cope with the unplanned changes in scope and would have resulted in additional follow on project work. They estimated that the project would have been only 60% complete at end of the original budget. The alternative Waterfall approach would, therefore, have resulted in 40% higher costs than the ThoughtWorks' Agile approach.

Savings were also driven by the reference organization's ability to simplify the application development process through a reduction in errors compared to a similarly sized application development project.

Table 5 illustrates the estimated status of project completion by the end of the first year of development effort. Table 6 compares the costs of the ThoughtWorks solution to the estimated costs of a traditional Waterfall approach from another third-party developer.

Table 5: Project Completion - Agile Development Versus Alternative

Ref.	Project benefits	Calculation	Total
D1	Project completion with ThoughtWorks at end date of original project timeline		100%
D2	Project completion with alternative at end date of original timeline		60%
C4	Total project fees with ThoughtWorks		£2,468,800
D4	Total project fees with alternative	$(D1-D2) \times C4$	£3,456,320
D5	Cost avoidance from ThoughtWorks	$D4 - C4$	£987,520

Source: Forrester Research, Inc.

Table 6: Project Cost Efficiencies

Ref.	Project benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
C4	Project costs with ThoughtWorks (including internal costs and support)		£2,324,800	£36,000	£36,000	£36,000	£36,000	£2,468,800
D4	Project costs with alternative (including internal costs and support)	$(D1-D2) \times C4$	£3,254,720	£50,400	£50,400	£50,400	£50,400	£3,456,320
D5	Cost avoidance from ThoughtWorks	$D4 - C4$	£929,920	£14,400	£14,400	£14,400	£14,400	£987,520

Source: Forrester Research, Inc.

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Reduced Time to Benefit

In addition to driving IT efficiency, ThoughtWorks' Agile development sped up the time to deployment and therefore allowed the organization to realize business benefits sooner. ThoughtWork's Agile approach forced the organization to understand the business needs upfront to prioritize specific functionality, which in turn allowed key benefits to be realized early. This created further buy-in from the business side and reduced the risk of scope creep.

Conversely, if the representative organization chose not to engage with ThoughtWorks, the time to realize benefits would be lengthened, therefore reducing the total amount of benefits achieved within the three-year timeframe and extending the payback for the project.

The business benefits derived from the new platform included increased revenues from more targeted advertising and productivity gains within the organizations editing and production functions. The time-to-benefit advantage was particularly important for the reference organization since the reference organization earns a premium on advertising revenue from its position as a market leader.

Table 7 illustrates the ramp up time between the project using ThoughtWorks and a project without including ThoughtWorks.

Table 7: Time To Benefits- Agile Development Versus Alternative

Ref.	Project benefits	Calc.	Year 1	Year 2	Year 3	Year 4	Year 5	Total
F1	Potential business benefits from new online platform (increased revenues and reduced editorial costs)			£228,000	£196,875	£0	£0	£424,875
F2	% of business benefits realized with ThoughtWorks		0%	100%	100%	100%	100%	
F3	% of business benefits realized with alternative		0%	0%	25%	100%	100%	
F4	Business benefits realized with ThoughtWorks	F1 x F2	£0	£228,000	£262,500	£297,000	£338,400	£1,125,900
F5	Business benefits realized with Alternative	F1 x F3	£0	£0	£65,625	£297,000	£338,400	£701,025
F6	Reduced Time to Benefit	F5 – F4	£0	£228,000	£196,875	£0	£0	£424,875

Source: Forrester Research, Inc.

Total Benefits

The total benefits are shown in table 8 below.

Table 8: Total Benefits

Ref.	Project benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
D5	Cost Reduction		£929,920	£14,400	£14,400	£14,400	£14,400	£987,520
F6	Reduced Time to Benefit		£0	£228,000	£196,875	£0	£0	£424,875
G3	Total Benefits	D5 + F6	£929,920	£242,400	£211,275	£14,400	£14,400	£1,412,395

Source: Forrester Research, Inc.

Risk

Risk is the third component within the TEI model; it is used as a filter to capture the uncertainty surrounding different cost and benefit estimates. If a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed because the risks that threaten the project have been taken into consideration and quantified. The risk-adjusted numbers should be taken as “realistic” expectations, since they represent the expected values considering risk. In general, risks affect costs by raising the original estimates and they affect benefits by reducing the original estimates.

For the purpose of this analysis, Forrester risk-adjusts cost and benefit estimates to better reflect the level of uncertainty that exists for each estimate. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points.

In this study, Forrester discovered that engaging with ThoughtWorks was a relatively low-to-medium risk endeavor, as expressed by the interviewed organizations as compared to similar past projects that were undertaken without ThoughtWorks’ assistance.

The following general risks were considered in this report:

- Lack of sufficiently trained internal staff to interact with and meet the requirements of a ThoughtWorks-driven project.
- Failure to reduce, transfer, or redeploy IT support and business unit headcount made redundant in a ThoughtWorks-driven project.
- Changing external market conditions that may decrease time-to-market benefit estimates.

Tables 9 and 10 show the values used to adjust for uncertainty in cost and benefit estimates. Different cost and benefits estimates have different levels of risk adjustments. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

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Risk adjustments for costs increase the original costs estimates. For example, Forrester applies a risk range of 100% on the low end of the estimate and 105% on the most likely and 110% high end for ThoughtWorks development fees.

Table 9: Cost Category Risk Adjustments

Ref.	Risk to cost	Low	Most likely	High	Risk adjusted
H1	ThoughtWorks Development Fees	100%	105%	110%	105%

Source: Forrester Research, Inc.

Risk adjustments for benefits reduce the original benefits estimates. For example, Forrester applies a risk range of 80% on the low end of the estimate and 90% on the most likely and 100% high end for cost efficiencies benefit.

Table 10: Benefit Category Risk Adjustments

Ref.	Risk to benefit	Low	Most likely	High	Risk adjusted
I1	Cost Efficiencies	80%	90%	100%	90%
I2	Time-to-benefit	80%	90%	100%	90%

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

The benefits calculated in this Case Study are derived from the pilot project to create and migrate to a development and production platform for a subset of online content. This pilot site was launched 9 months after project commencement. The technical and organizational learnings from this project provided the reference organization with the option to launch a staged (iterative) roll-out program to replatform all their online content.

This increased flexibility from the ThoughtWorks solution does not afford benefits during the first two years of the project and could be captured later when the reference organization launches the new platform for all of its online content. The existence of the option to capture these savings has a present value that can be estimated. The flexibility component of TEI captures that value using the financial industry standard Black-Scholes options valuation formula.

Forrester believes that there is quantifiable value in having the flexibility and agility to implement all of the online content in years 3, 4 and 5. In the reference organization, Forrester values these flexibility options at £1,305,002. Table 11 below shows the benefit inputs to the flexibility benefit calculation.

Table 11: Flexibility Benefit Calculations

Ref.	Project benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total
J1	Cost Reduction				£3,800,000	£240,000	£240,000	£4,280,000
J2	Reduced Time to Benefit		£0	£0	£2,100,000	£2,292,188	£0	£4,392,188
J3	Total Benefit	J1 + J2	£0	£0	£5,900,000	£2,532,188	£240,000	£8,672,188
J4	Cost of ThoughtWorks Solution				£7,000,000	£0	£0	£7,000,000
J5	Net Benefit	J4 – J3						£1,672,188
J6	Flexibility Benefit*							£1,305,002

Source: Forrester Research, Inc.

*Discounted using Black Scholes options valuation formula. The value of flexibility is clearly unique to each organization, and the willingness to measure its value varies from one organization to another. For additional information regarding flexibility options and calculations, please see Appendix A.

TEI Framework: Summary

Considering the financial framework constructed above, the results of the costs, benefits, risk, and flexibility sections using the representative numbers can be used to determine a return on investment, net present value, and payback period. Table 12 shows the consolidation of the numbers for the composite organization.

Table 13 below shows the risk-adjusted values, applying the risk adjustment method indicated in the “Risks” section and the values from Tables 9 and 10 to the numbers in Tables 4 and 8.

Table 12: Composite Company ROI, Non-Risk-Adjusted

Ref.	Total benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total	NPV
K1	Total costs		£1,700,000						£1,545,455
K2	Total benefits		£929,920	£242,400	£211,275	£14,400	£14,400	£1,412,395	£1,223,223
K3	Flexibility								£1,305,002
K4	Total	K2 + K3							£2,528,225
K5	Return on investment	K4 / K1							64%

Source: Forrester Research, Inc.

Table 13: Composite Company ROI, Risk-Adjusted

Ref.	Total benefits	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5	Total	NPV
R1	Total costs		£1,785,000						£1,622,728
R2	Total benefits		£836,928	£218,160	£190,148	£12,960	£12,960	£1,271,156	£1,100,901
R3	Flexibility								£1,174,502
R4	Total	R2 + R3							£2,275,403
R5	Return on investment	R4 / R1							40%

Source: Forrester Research, Inc.

It is important to note that values used throughout the TEI Framework are based on in-depth interviews with the reference organization. Forrester makes no assumptions as to the potential return that other organizations will receive within their own environment. Forrester strongly advises that readers use their own estimates within the framework provided in this study to determine the expected financial impact of ThoughtWorks Agile development.

Study Conclusions

This report is meant to provide the reader with a framework to examine the costs and benefits of engaging with ThoughtWorks using ThoughtWorks Agile approach. Data derived from an individual customer interview corroborates Forrester Research’s findings around the potential for Agile development to drive cost efficiencies within a given environment. The core tenets of Agile development — short iterative cycles, empowered teams, constant reprioritization of requirements, and strong business participation — all lead to increased benefits. Delivering core requirements in shorter timeframes leads to increased financial benefits. Increasing team efficiency reduces both development and maintenance costs, and frees the development organization to address other projects. Each of these can be quantified using Forrester’s TEI model.

Not every project is a good fit for Agile development, but ThoughtWorks has demonstrated that applying Agile processes and strong project management can potentially be a benefit to high-risk projects. Its emphasis on hiring and retaining highly skilled staff is also a key success factor.

The financial analysis provided in this study illustrates the potential way an organization can evaluate the value proposition of ThoughtWorks’ Agile development. Based on information collected in in-depth customer interviews, Forrester calculated a five-year risk-adjusted ROI of 40% for the reference organization. All final estimates are risk-adjusted to incorporate potential uncertainty in the calculation of costs and benefits.

Based on these findings, companies looking to implement ThoughtWorks Agile development can derive cost savings and productivity benefits. Using the TEI framework, many companies may find the potential for a compelling business case to make such an investment.

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.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility. For the purpose of this analysis, the impact of flexibility was not quantified.

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 forms of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

Risk

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

Flexibility

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

Appendix B: Glossary

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

Net present value (NPV): The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

Present value (PV): The present or current value of (discounted) cost and benefit estimates given an interest rate (the discount rate). The PV of costs and benefits feed into the total net present value of cash flows.

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

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

A Note On Cash Flow Tables

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

Example Table

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

Source: Forrester Research, Inc.