The Total Economic Impact Of Google Cloud Platform

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Executive Summary

In March 2014, Google commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential value that enterprises may realize by utilizing Google Cloud Platform and in particular Google App Engine. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Google Cloud Platform on their organizations.

To better understand the benefits, costs, and risks associated with using Google App Engine, Forrester interviewed customers with multiple years of experience using App Engine. Three of the customers began using App Engine when the companies were founded. Two of the companies previously built out internal infrastructure, but later migrated to Google App Engine.

In each case, a reason that the companies chose to use Google App Engine instead of building infrastructure internally is because of its ability to scale — one customer scaled to more than 1 million users within 30 days.

Using App Engine allowed the companies to focus on the creative aspect of building applications without diverting management attention or working capital to infrastructure.

Other benefits that surprised the companies include:

› The Google name resonates with their customers.

› Using Google makes SAS70 certification easier.

› App Engine fostered innovation among developers.

Google App Engine benefits its customers by allowing software engineering companies to:

Scale from startup to millions of users without growing pains.

Replace more than $2.3 million in capital expenditures for a startup company.

Accelerate product development to generate more than $25.2 million in incremental revenue.

GOOGLE APP ENGINE ENABLES MORE RAPID REVENUE GROWTH

Our interviews with five existing customers and subsequent financial analysis found that a composite organization based on these companies was able to avoid capital expenditures of more than $2.3 million and avoid more than $1.1 million in administration costs. (See Appendix A for a description of the composite organization.)

The avoided costs were invested into hiring 17 more developers, which got products to market faster, and generated more than $13.9 million in incremental revenue — an increase of 23% — over three years.

TABLE 1
Composite Company Three-Year Impact

Costs avoided	Incremental developers hired	Incremental revenue generated
$3,496,947	17	$13,950,000

Source: Forrester Research, Inc.

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

- **Hiring incremental developers for a total cost of more than $5.5 million.** The cumulative cost of hiring 17 more developers over the three years with an average burdened salary of $110,000.

- **Paying usage fees for Google App Engine of more than $2.3 million.** The cost for development and application hosting over three years, based on the applications built and deployed by the composite company.

› **Benefits.** The composite organization realized the following benefits:

- **Incremental revenue of more than $13.9 million.** Adding developers allowed the composite company to release more products and get to market faster, generating 23% more revenue.

- **Avoided cost of internal development environment of $620,000.** The composite company used Google App Engine as a flexible platform for its development environment.

- **Avoided cost of internal application hosting of more than $2.8 million.** The composite company hosted its applications on App Engine and avoided spending its capital to host applications.

Disclosures

The reader should be aware of the following:

› The study is commissioned by Google and delivered by Forrester Consulting.

› Forrester makes no assumptions as to the potential return on investment 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 Google Cloud Platform and Google App Engine.

› Google 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 Google.

TEI Framework And Methodology

INTRODUCTION

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing Google App Engine.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

APPROACH AND METHODOLOGY

Forrester took a multistep approach to evaluate the impact that Google App Engine can have on an organization (see Figure 1). Specifically, Forrester:

› Interviewed Google executives and Forrester analysts to gather data relative to App Engine and the marketplace for application hosting.

› Interviewed five organizations currently using Google App Engine to obtain data with respect to costs, benefits, and the related risks.

› Designed a composite company based on characteristics of the interviewed organizations (see Appendix A).

› Constructed a financial model representative of the data obtained from the interviews. The model is then applied to the composite organization.

Forrester employed four fundamental elements of TEI in modeling Google's App Engine:

› Costs.

› Benefits to the entire organization.

› Flexibility.

› Risk.

Given that enterprises are using increasingly sophisticated methods to estimate the expected ROI from investments, Forrester's TEI methodology provides a complete picture of the total economic impact. Please see Appendix B for additional information on the TEI methodology.

FRAMEWORK ASSUMPTIONS

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

FIGURE 1
TEI Approach

Perform due diligence → Conduct customer interviews → Design composite organization → Construct financial model using TEI framework → Write case study

Source: Forrester Research, Inc.

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Analysis

COMPOSITE ORGANIZATION

For this study, Forrester conducted a total of five interviews with representatives from the following companies:

› **Developer of consumer applications for mobile devices.** The company passed 1 million users within 30 days of releasing its inaugural app and has more than 45 million users for all of its apps in less than four years.

› **Developer of apps for business users.** The company launched an initial product with more than 300,000 paid users and exceeded 4 million paid users within three years across a diverse product line of five apps.

› **Integrator of mobile gaming apps.** The company owns many gaming apps — some developed in-house and others acquired and integrated. As a whole, the company supports more than 150 million daily average users.

› **Government agency migrating a legacy app.** The agency migrated the functionality of a legacy application onto a platform designed for mobile access and usability.

› **Retailer expanding to include mobile as part of the customer experience.** The company integrated its website and customer preferences with proximity tools to provide special offers to loyal customers.

Based on the interviews, Forrester constructed a TEI framework, a composite company, and analysis that illustrates the areas financially affected. The composite organization that Forrester synthesized from these results represents an organization with the following characteristics:

› A company that engineers and launches its first app.

› Begins with five developers and expands to 60 software engineers during the three years in Forrester's model.

› Focuses entirely on building and marketing apps to the market by using Google App Engine during development and to host the production environment.

› Expands from 10,000 users at the initial product release to more than 3.6 million daily average users at the end of three years.

INTERVIEW HIGHLIGHTS

The three-year model used for the composite company comes from the experiences derived in Forrester's interviews with five Google Cloud Platform customers.

Situation

The composite company was facing challenges that led it to evaluate Google App Engine, including:

› Company leaders came from software development backgrounds and felt that building out infrastructure would be a distraction from core goals.

› Accelerate the development environment with flexible resources, such as the ability to spin up new server instances for testing, rather than waiting for resources to become available.

› Uncertainty about the number of users that would use the app when it was released. Applications can spiral up to literally millions of users within weeks, making it hard to predict the appropriate level of investment for hosting infrastructure.

› Looking for ways to enhance app performance using tools that are available in the market, including application enablers such as data stores and task queues.

› Providing high app performance to users around the globe without incurring the significant expense on building out global infrastructure and managing data movement between locations.

"We lived through the days of stacking servers, applying patches, updating software, and trying to scale. Google App Engine freed us from all those problems. Enough said!"

~Director, software engineering, gaming company

Solution

The composite organization selected Google App Engine because it provided:

› Low entry cost for a startup with unlimited scalability to support apps that prove successful.

› Developers need just laptops and monitors, freeing up capital (from infrastructure) to hire great developers.

› Ability to easily roll back to previous releases of source code, allowing the company to move forward aggressively.

› Provides access to Google Cloud Storage, Google Compute Engine, Google Task Queue, and other application enablers provided by Google Cloud Platform.

"We had more than 1 million users within 30 days. It would have been impossible for us to support that kind of growth on our own. It was easy with Google App Engine."

~VP, software engineering, gaming company

Results

Forrester's interviews revealed that the composite company realized the following benefits:

› **Scalable infrastructure.** One customer explained how the game application was a viral success, spiraling to more than 1 million users in 30 days and more than 4 million users within 90 days. Google App Engine handled the growth "even better than we imagined" said the vice president of software engineering at a gaming company.

› **Easy-to-use development platform.** The training and ramp time for developers is fast. In Forrester's modeling, the faster ramp time boosted the revenue per developer by 20% during each developer's first year.

"It's easy to train developers because of the online training that is available and the support community. Developers quickly understand the App Engine platform. We have them productive within a couple weeks."
~Director, software engineering, gaming company

› **Avoid cost of development environment.** With Google App Engine, developers are able to run a self-contained development environment on laptops, resulting in high productivity.

From the company point of view, it is able to deploy many instances of the application at different stages of development, resulting in a structured and maintainable process for graduating releases from inception all the way to production.

› **Avoided investment in application hosting.** During the interviews, executives listed the infrastructure, people, or operational processes that using Google App Engine allowed them to avoid.

The list of avoided assets includes:

• LAMP-stack servers.

• Windows servers.

The list of avoided staff includes:

• Database administrators (DBAs).

• Network professionals.

• System administrators.

The list of avoided processes includes:

• Load balancing.

• Machine imaging.

• Patch management.

"As a startup, we hired a lot of developers. The faster that they are productive, the faster we can release products. Products give us revenue that helps us grow bigger faster."

~Director, software engineering, gaming integrator

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AVOIDED COSTS

The composite organization avoids more than $3.4 million in costs over three years using Google App Engine.

Avoided Cost Of Internal Development Environment

Based on the composite company profile, it would have required assets for development, performance testing, user acceptance testing, and pre-production. The number of servers would increase as the composite company developed additional applications.

At an average cost per server of $20,000, including 1 TB of storage, operating systems, databases, and related costs for network connectivity and backups, the total avoided cost is $620,000 over three years (see Table 2).

Avoided Cost Of Internal Application Hosting

Similarly, the composite company avoids spending more than $2.8 million over three years by using Google App Engine to host the applications that are in production (see Table 3).

Forrester's model includes:

› Fully loaded servers that cost $20,000 to purchase.

› System administrators that manage an average of 30 servers and have a burdened salary of $85,000.

› Database administrators that support an average of 22 servers and have a burdened salary of $125,000.

TABLE 2

Avoided Cost Of Internal Development Environment

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
A1	Servers to purchase		11	15	5	
A2	Cost of assets	A1*$20,000	$220,000	$300,000	$100,000	
At	Avoided cost of internal development environment	A2	$220,000	$300,000	$100,000	$620,000

TABLE 3

Avoided Cost Of Internal Application Hosting

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
B1	Servers to purchase		5	32	59	
B2	Cost of assets	B1*$20,000	$100,878	$639,167	$1,026,678	
B3	Cumulative servers	B1+ previous year	5	37	88	
B4	System administrators	B3/30	0.2	1.2	2.9	
B5	Cost of system admins	$85K per FTE	$14,291	$104,840	$250,286	
B6	Database administrators	B3/22	0.2	1.7	4.0	
	Cost of database admins	$125K per FTE	$28,658	$210,240	$501,910	
Bt	Avoided cost of internal application hosting	B2+B4+B6	$143,827	$954,246	$1,778,873	$2,876,947

Source: Forrester Research, Inc.

ACCELERATED REVENUE STREAMS

For the composite company, Forrester created a portfolio of five applications — two applications are sold to businesses through a direct sales force; three applications are marketed to consumers. (Additional detail about the applications and revenue streams is in Appendix A.)

Based on the five companies that Forrester interviewed, the average revenue per developer during the first three years was:

› Year 1 — $50,000. The company develops an inaugural application and releases it to the market.

› Year 2 — $175,000. The company improves the original application and begins releasing add-ons or extensions to the core application.

› Year 3 — $225,000. The company manages a portfolio of applications with a stream of releases.

Year 1

The composite company uses Google App Engine as its development environment and hosting platform, allowing it to hire three additional developers. The extra developers drive $150,000 in revenue and $60,000 in gross profit.

Year 2

The additional three developers make a significant contribution in Year 2 and are augmented by nine additional hires, for a total of 12 incremental developers that boost the composite organization's revenue by more than $2.8 million.

At a gross profit margin of 40%, the extra revenue yields more than $1.1 million in gross profit. Typical of a startup company, it reinvests 50% of the gross profit into additional developers.

Year 3

By investing the capital from avoided costs into additional developers, the composite organization hires five more developers in Year 3, for a total of 17 developers that it hired earlier that would have otherwise been possible. The impact of 17 developers is more than $10.9 million in revenue.

Total Accelerated Revenue

Over the three years, the ability to hire 17 incremental developers yields a total of more than $13.9 million in revenue for the composite company.

TABLE 4
Accelerated Revenue

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
E1	Incremental developers hired each year		3	9	5	
E2	Cumulative developers hired earlier than planned		3	12	17	
E3	Average revenue per developer	From interviews	$50,000	$175,000	$225,000	
E4	Accelerated revenue	E2*E3	$150,000	$2,850,000	$10,950,000	$13,950,000
E5	Gross profit margin		40%	40%	40%	
Et	Accelerated gross margin	E4*E5	$60,000	$1,140,000	$4,380,000	$5,580,000

Source: Forrester Research, Inc.

Total Benefits

Table 5 shows the total benefits from the areas previously discussed. Over three years, the composite organization realized benefits that include:

Unquantified Benefits

› **Scalable infrastructure.** Beginning as a startup and rapidly expanding into a company with thousands (or millions) of users requires infrastructure that is able to scale rapidly, transparently, and most importantly, easily.

› **Simplified certification.** Google is already certified for SAS70 and SSAE16, making it simpler for startups to go through certification. Companies must only certify from the path from source code to the App Engine platform.

› **Enhanced availability.** Google App Engine has many locations around the globe, providing redundancy across data centers that would be extremely costly to duplicate, resulting in extremely high availability of our app.

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 ability to engage in future initiatives that would otherwise be impossible. Flexibility is described in more detail in Appendix B.

Google App Engine creates flexibility for the composite company in several ways. Specifically, App Engine enables the company to:

› **Expand or contract rapidly.** Regardless of changes that come via merger, acquisition — organic or inorganic — the virtual nature of the development and hosting allows for growing, shrinking, transferring, or centralizing easily.

› **Foster innovation.** After time, developers began spinning up new App Engine instances and pulling in the needed libraries to experiment with ideas.

> "New prototypes pop up all the time simply because a developer decided to try a new idea."
> ~*Director, software engineering, game integrator*

TABLE 5 Total Benefits				
Benefit	**Year 1**	**Year 2**	**Year 3**	**Total**
Gross profit on incremental revenue	$220,000	$300,000	$100,000	
Avoided cost of internal development environment	$143,827	$954,246	$1,778,873	
Avoided cost of internal application hosting	$60,000	$1,140,000	$4,380,000	
Total benefits	$423,827	$2,394,246	$6,258,873	$9,076,947

Source: Forrester Research, Inc.

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INCURRED COSTS

The composite organization incurred two costs by using Google App Engine rather than building out its own internal infrastructure:

› Hiring incremental developers.

› Paying usage fees for Google App Engine.

Hiring Incremental Developers

Hiring the 17 incremental developers, at an average salary of $110,000, incurs a cost of more than $5.5 million over three years (see Table 6).

Paying Usage Fees For Google App Engine

To calculate the cost of Google App Engine, Forrester used input from the five companies interviewed. In actuality, the cost of App Engine is based on many variables, including server instances, storage utilization, peak provisioning, failover, and diurnal usage patterns and spikes.

Forrester uses a standard price of $8,000 per server per year for the development environment and $16,000 per server per year for application hosting (see Tables 2 and 3).

In total, the cost for the composite organization to use Google App Engine for both development and hosting over three years totals more than $2.3 million (see Table 7).

TABLE 6
Hiring Incremental Developers

Ref.	Cost	Calculation	Year 1	Year 2	Year 3	Total
D1	Incremental developers		3	12	17	
D2	Incremental salary costs	$110,000 per developer	$330,000	$1,320,000	$1,870,000	
D3	Cumulative cost	D2 + previous years	$0	$330,000	$1,650,000	
Dt	Total cost of incremental developers	D2+D3	$330,000	$1,650,000	$3,520,000	$5,500,000

TABLE 7
Paying Usage Fees For Google App Engine

Ref.	Cost	Calculation	Year 1	Year 2	Year 3	Total
C1	Development servers		11	15	5	
C2	Equivalent cost for App Engine	C1 * $8,000	$88,000	$120,000	$40,000	
C3	Application hosting servers		5	34	59	
C4	Equivalent cost for App Engine	C3 * $16,000	$80,702	$592,036	$1,413,378	
Ct	Total cost of usage fees	C2+C4	$168,702	$712,036	$1,453,378	$2,334,116

Source: Forrester Research, Inc.

TOTAL COSTS

The total costs incurred by the composite organization over three years total more than $7.8 million. The cost of incremental developers was a strategic choice by the composite organization — it chose to defer fixed costs and capital expenditures and use the resources to hire developers, decrease time-to-market, and further accelerate company growth.

TABLE 8
Total Costs

Benefit	Year 1	Year 2	Year 3	Total
Hiring incremental developers	$330,000	$1,650,000	$3,520,000	
Usage fees for Google App Engine	$168,702	$712,036	$1,453,378	
Total benefits	$498,702	$2,362,036	$4,973,378	$7,834,116

Source: Forrester Research, Inc.

RISK

Quantitatively capturing investment and impact risk by directly adjusting the financial estimates results in more meaningful and accurate estimates and a more accurate projection of the ROI.

In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates. The risk-adjusted numbers should be taken as "realistic" expectations since they represent the expected values considering risk. Table 9 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates.

The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points.

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

TABLE 9

Cost And Benefit Risk Adjustments

Costs	Application to readers	Low	Most likely	High	Mean
Hiring incremental developers	Will incremental hiring be at the same level for most companies?	100%	100%	125%	108%
Usage fees for App Engine	Are usage fees likely to be similar for most companies?	98%	100%	105%	101%

Benefits		Low	Most likely	High	Mean
Incremental revenue	Will the incremental revenue be similar for most companies?	50%	100%	110%	87%
Avoided cost of internal development environment	Will the cost savings for development be similar for most company?	80%	100%	103%	94%
Avoided cost of internal application hosting	Will the cost savings of hosting be similar for most companies?	80%	100%	103%	94%

Source: Forrester Research, Inc.

Financial Summary

The financial results calculated in the Costs and Benefits sections can be used to determine the NPV and payback period for the organization's investment in App Engine. These are shown in Table 10 below.

Table 11 below shows the risk-adjusted NPV and payback period values. These values are determined by applying the risk-adjustment values from Table 9 in the Risk section to the cost and benefits numbers in Tables 5 and 8.

TABLE 10
Cash Flow: Non-Risk-Adjusted

Cash flow: original estimates

	Initial	Year 1	Year 2	Year 3	Total	Present value
Costs	$0	($498,702)	($2,362,036)	($4,973,378)	($7,834,116)	($6,142,033)
Benefits	$0	$423,827	$2,394,246	$6,258,873	$9,076,947	$7,066,397
Net benefits	$0	($74,875)	$32,211	$1,285,495	$1,242,831	$924,364

TABLE 11
Cash Flow: Risk-Adjusted

Cash flow: risk-adjusted estimates

	Initial	Year 1	Year 2	Year 3	Total	Present value
Costs	$0	($525,102)	($2,494,036)	($5,254,978)	($8,274,116)	($6,486,695)
Benefits	$0	$401,998	$2,318,991	$6,146,141	$8,867,130	$6,899,661
Net benefits	$0	($123,105)	($175,044)	$891,163	$593,014	$412,966

Source: Forrester Research, Inc.

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Google Cloud Platform And Google App Engine: Overview

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

Google App Engine is Google's platform-as-a-service (PaaS). Develop your application easily using built-in services that make you more productive. Deploy to a fully managed platform and let Google carry the pager. Just download the SDK and start building immediately for free with no credit card required.

Popular Languages And Frameworks

Write applications in some of the most popular programming languages: Python, Java, PHP, and Go. Use existing frameworks such as Django, Flask, Spring, and webapp2. Develop locally with language-specific SDKs. Pair your applications with Compute Engine to integrate other familiar technologies such as Node.js, C++, Scala, Hadoop, MongoDB, Redis, and more.

Focus On Your Code

Let Google worry about database administration, server configuration, sharding, and load balancing. With Traffic Splitting, you can A/B test different live versions of your app. Multitenancy support lets you compartmentalize your application data.

Multiple Storage Options

Choose the storage option you need: a traditional MySQL database using Cloud SQL, a schema less NoSQL data store, or object storage using Cloud Storage.

Powerful Built-In Services

App Engine makes you more productive by eliminating the need to write boilerplate code. Managed services, such as Task Queues, Memcache, and the Users API, let you build any application.

Familiar Development Tools

Use the tools you know, including Eclipse, IntelliJ, Maven, Git, Jenkins, PyCharm, and more. The App Engine SDK allows you to test applications locally in a simulated environment and then deploy your app with simple command-line tools or the desktop launcher.

Deploy At Google Scale

Some of the world's most popular web services are built on our platform. You can scale up to 7 billion requests per day and automatically scale down when traffic subsides.

Appendix A: Composite Organization Description

For this TEI study, Forrester created a composite organization to illustrate the quantifiable costs and benefits of using App Engine. The composite company is intended to represent a startup technology company that designs and releases successful applications, experiencing hyper-growth. The composite company is based on characteristics of the customers using Google App Engine that Forrester interviewed.

The composite company has the following objectives:

› Focus the attention of developers, managers, and working capital on building creative, innovative applications.

› Provide flexible resources for development, including source code, testing, and integration.

› Enable rapid and unlimited scalability so that the hosting environment never constrains application growth.

› Leverage application enablers such as data stores, task queues, and redundant instances.

During the three years in Forrester's model, the composite company releases five applications. The growth rate used in the model for each type of application came from Forrester's interviews with existing App Engine customers. Table 12 shows the revenue streams for each of the applications over the three years in Forrester's model.

The applications used in the model for the composite company include:

› Business applications:

• Application #1 is used on multiple types of devices. The composite company uses a direct sales force to sell the application, giving it steady growth.

• Application #2 is an add-on to Application #1. The add-on is released 18 months later and expands the footprint of the composite company within its installed base.

› Consumer applications:

• Application #3 is for consumers and sells online. It is promoted through marketing and word of mouth. The application is an instant success and has staying power. Revenues for the composite company continue growing over the three years in Forrester's model.

• Application #4 is an extension of Application #3 that is released 18 months after Application #3. This application enjoys immediate success and follows the same growth path as Application #3.

• Application #5 is a game that had initial success before declining in popularity.

TABLE 12
Application Revenue Streams For The Composite Company

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
F1	Application #1 revenue		$594,000	$8,020,000	$15,148,000	
F2	Application #2 revenue		$0	$135,000	$785,000	
F3	Application #3 revenue		$320,000	$4,150,000	$13,242,000	
F4	Application #4 revenue		$0	$670,000	$2,880,000	
F5	Application #5 revenue		$0	$1,390,000	$845,000	
Ft	Total application revenue streams	F1+F2+F3 +F4+AF	$914,000	$14,365,000	$32,900,000	$48,179,000

Source: Forrester Research, Inc.

Appendix B: Total Economic Impact™ Overview

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients.

The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders. The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility.

BENEFITS

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization.

The TEI methodology and the resulting financial model place equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created.

In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

COSTS

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the form of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value.

In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

RISK

Risk measures the uncertainty of benefit and cost estimates contained within the investment.

Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections, and 2) the likelihood that the estimates will be measured and tracked over time.

TEI applies a probability density function known as "triangular distribution" to the values entered. At minimum, three values are calculated to estimate the underlying range around each cost and benefit.

FLEXIBILITY

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment.

Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made.

For instance, an investment in an enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated.

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

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Appendix C: Glossary

TERMS USED BY FORRESTER

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

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

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

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

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

A NOTE ON CASH FLOW TABLES

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

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