



A Forrester Total Economic
Impact™ Study
Commissioned By
Microsoft

Project Director:

Sean Owens

June 2016

The Total Economic Impact™ Of Microsoft Azure Platform-As-A- Service

Cost Savings And Business Benefits
Enabled By Azure PaaS

FORRESTER®

Table Of Contents

Executive Summary	3
Disclosures	4
TEI Framework And Methodology	5
Analysis	6
Financial Summary	22
Microsoft Azure: Overview.....	23
Appendix A: Composite Organization Description	24
Appendix B: Total Economic Impact™ Overview.....	25
Appendix C: Forrester And The Age Of The Customer	26
Appendix D: Glossary.....	27
Appendix E: Endnotes	27

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

Microsoft commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study to examine the potential return on investment (ROI) enterprises may realize by shifting their application development and deployment to Azure platform-as-a-service (PaaS). The purpose of this study is to give readers a framework to evaluate the potential financial impact, or ROI, of leveraging Azure PaaS for their organizations. This ROI represents benefits gained by customers that moved from infrastructure-as-a-service (IaaS) to platform-as-a-service (PaaS). For customers migrating from on-premises environments to PaaS, the return on investment can be even greater. PaaS allows customers to focus on application innovation without the complexity of building and maintaining the underlying infrastructure, and removes the need to perform many IT tasks like patching, networking, and server management.

To better understand the benefits, costs, and risks associated with an Azure PaaS implementation, Forrester interviewed eight customers that had several years of experience with Azure IaaS and had more recently adopted Azure PaaS. They leverage specific service offerings such as App Service, SQL Database, and Azure Active Directory.

With Azure PaaS, customers were able to streamline and automate processes across key functions and lines of business, enabling them to meet their objectives, keep costs in check, and increase revenue. They also said that the ease of development and management meant more applications were created and updated, providing greater value to the organizations and their customers. The strategist and founder of a US IT services firm said: “Developing our app without PaaS? Well, we wouldn’t have done it. Frankly, the extra time and resources required would have wiped out any profit that we have generated.”

Forrester created a representative organization based on the composite results of the interviews with the customer organizations: a medium-size business with 100 applications now supported by Azure PaaS (and more planned each year).

AZURE PAAS HELPS IMPROVE TIME-TO-MARKET AND REDUCE MANAGEMENT TIME

Interviews with existing Azure PaaS customers and subsequent financial analysis found that the representative organization based on these organizations experienced the risk-adjusted ROI, benefits, and costs shown in Figure 1.¹ See Appendix A for a description of the representative organization.

The representative organization five-year analysis estimates a 466% ROI and a net present value (NPV) of more than \$5.9 million. Key improvements enabled by Azure PaaS include an 80% reduction in IT administration time required to manage apps deployed on the platform, a 25-hour average reduction in development and testing time required to develop or update Azure PaaS applications, and a 50% reduction in time required to help deploy a new application solution to a client.

FIGURE 1
Financial Summary Showing Five-Year Risk-Adjusted Results



Source: Forrester Research, Inc.

“Developing our app without PaaS? Well, we wouldn’t have done it. Frankly, the extra time and resources required would have wiped out any profit that we have generated.”

— Strategist and founder of a US IT services firm

› **Benefits.** The representative organization, based on current Azure customers, saw the following risk-adjusted benefits:

- **Eighty percent less IT administration time was required for applications on PaaS, allowing the organization to focus on application innovation, not administrative tasks.** The organization used to spend significant time on server patching, networking setup, firewall configuration, and many other server-related tasks now included with Azure PaaS. This adds up to \$132,240 saved in the first year.
- **IT teams can reallocate or avoid hiring five IT administrators and two database administrators (DBAs) to other teams or more value-added tasks, adding up to \$697,000 saved per year.** The organization would have needed to hire five new IT administrators and two DBAs within the first year to meet the demand and service otherwise enabled by Azure PaaS.
- **The organization improved application delivery time-to-market by 50% with Azure PaaS, leading to \$376,441 in increased profit in the first year.** The organization could deliver applications running on Azure in half the time, meaning revenue could be earned more quickly.
- **The organization saved 25 hours in application testing and development time per application created or updated, improving developer productivity and adding up to \$108,458 saved in the first year.** With Azure PaaS, developers can take advantage of integrated tools and, with the push of a button, testers can create new testing environments that exactly match the organization's development and production environments.
- **The organization saw \$98,550 in employee issue identification and repair resource cost savings in the first year.** The representative organization deployed an employee-facing mobile application on Azure PaaS to meet a specific need related to facilities issue identification and repair, saving significant time and resource costs compared with the earlier paper-based processes.
- **The organization deployed customer-facing applications, leading to \$168,750 in the first year in new profit from improved sales rep performance and direct customer sales.** Both customer self-service and sales enablement apps are easier to develop and contribute to new revenue and profit for the organization.

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

- **Initial implementation costs of \$101,850 and ongoing resource and other costs related to Azure PaaS of \$73,500 in the first year.** While significant administration, development, and testing costs can be saved with Azure PaaS, some implementation, training, and management costs are expected.
- **Azure subscription and support fees of \$191,400 in the first year.** These are the estimated annual fees the representative organization paid to Microsoft for Azure PaaS services, billed monthly on a per-use basis.

Disclosures

The reader should be aware of the following:

- › The study is commissioned by Microsoft 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 Microsoft Azure PaaS.
- › Microsoft 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.
- › Microsoft provided the customer names for the interviews but did not participate in the interviews.

TEI Framework And Methodology

INTRODUCTION

From the information provided in the interviews, Forrester has constructed a Total Economic Impact (TEI) framework for those organizations considering implementing Microsoft Azure PaaS. 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 Microsoft Azure PaaS can have on an organization (see Figure 2). Specifically, Forrester:

- Interviewed Microsoft marketing, sales, and/or consulting personnel, along with Forrester analysts, to gather data relative to Azure PaaS and the marketplace for Azure PaaS.
- Interviewed eight organizations currently using Microsoft Azure PaaS to obtain data with respect to costs, benefits, and risks. Most also previously used or currently use Microsoft Azure IaaS and were able to provide some comparison experiences.
- Designed a representative, composite organization based on characteristics of the interviewed organizations (see Appendix A).
- Constructed a financial model representative of the interviews using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews as applied to the representative organization.
- Risk-adjusted the financial model based on issues and concerns the interviewed organizations highlighted in interviews. 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 Microsoft Azure PaaS: benefits, costs, flexibility, and risks.

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

FIGURE 2
TEI Approach



Source: Forrester Research, Inc.

Analysis

REPRESENTATIVE ORGANIZATION

For this study, Forrester conducted a total of eight interviews with representatives from the following companies, which are Microsoft customers based in the US:

- › Worldwide retail eCommerce firm based in Asia.
- › Boutique IT services firm in the Northwestern US.
- › Midsize European consulting and services organization.
- › Transportation authority for a large European city.
- › Small BI solution provider in the Southeastern US.
- › Midmarket procurement software and services provider based in the US.
- › Small development firm in the US focused on software and solutions for healthcare.
- › Midmarket enterprise content and information management services provider based in Europe.

“We had to manage patching of the SQL Server itself. Also, we would have to tell a DBA to worry about updating patches and do a lot more testing, especially performance testing to make sure that scales are leveled that we need in.”

~ Senior executive, global eCommerce firm

FIGURE 3
Interviewed Organizations



Source: Forrester Research, Inc.

Based on the interviews, Forrester constructed a TEI framework, a composite model, and an associated ROI analysis that illustrates the areas financially affected by an Azure PaaS implementation. The representative organization that Forrester synthesized from these results represents an organization with the following characteristics:

- It is a US-based eCommerce services firm that uses apps deployed on Azure PaaS to assist sales reps, allow customers to access services and make small purchases, and sell services to business customers.
- It has 2,000 employees, about 750 of whom use one or more internal apps deployed on Azure PaaS.
- Azure PaaS was added in the past year.
- The organization had been a consumer of Azure IaaS for several years (and has continued to be a consumer of Azure IaaS, though at a smaller scope).
- It deployed 100 apps (many related to simple internal processes and web applications) on Azure PaaS, with new and upgraded apps expected to grow that number each year.
- A small set of apps deliver sales enablement support to internal sales reps.
- A handful of those apps deployed to Azure PaaS deliver direct-to-customer services, such as a retail sales site and hosted business-to-business (B2B) services.
- The organization sells on-premises solutions, but since adopting Azure PaaS, it sells cloud services more often.

INTERVIEW HIGHLIGHTS

The representative organization, based on the business goals stated by interviewed organizations, was able to resolve business issues and take advantage of new opportunities.

Situation

Before Azure PaaS, the organization identified a few issues it wanted to improve or resolve:

- Application development and testing was often delayed due to environment setup, verification, and correction tasks; if the development and test environments don't match production, issues can be missed and rework is required.
- Resource time, including some resources with specialty skills, was required to deal with repetitive and what seemed like unnecessary tasks, such as needing to hire a DBA to manage new applications.
- Some very useful but noncritical applications were not updated or even developed in the first place. Such applications could save a lot of employee time and costs and potentially generate new revenue.
- Solution deployments for the organization's customers were very long and drawn out. Long waits and time-consuming tasks included: waiting for hardware deliveries, configuring and testing servers, deploying and integrating software, and monitoring and supporting any issues post deployment.

Solution

As an Azure infrastructure services customer, the organization realized that Azure's recent PaaS advancements targeted a

“We used to have to set up development environments, QA systems, and complete infrastructure tasks. All that stuff. It wasn’t a stretch to spend 50 days on that.”

~ Partner at a European consultancy

number of issues that it wanted to investigate. Azure PaaS was a great fit to help leverage its existing Azure infrastructure services and take advantage of specific IT and business improvement, cost saving, and revenue opportunities.

Results

The interviews revealed that:

› **Azure PaaS offerings can enable significant IT savings.**

Infrastructure-as-a-service provides computing resources that an organization can configure for just about anything it needs, but it requires a lot of management and setup. Azure PaaS delivers an application platform that ensures consistency and simplicity. Many IT tasks, like patching, updating, testing, networking, and others, are built in. The representative organization found:

- It can realize significant savings in the time required for the current IT team to manage apps running on Azure PaaS. “For a standard digital project, we don’t even need an infrastructure team anymore for apps running on Azure,” said the partner at a European consulting firm
- It can avoid significant IT and DBA future hires that had been planned before Azure PaaS was implemented.

› **The availability of new and improved apps with Azure PaaS helped employees save time.** Sales has better tools in client discussions, customers can more easily find and buy products and services, and the organization delivers solutions to its customers more efficiently. Apps can be more quickly and easily developed on Azure PaaS, even for a variety of mobile platforms, so more apps are likely to be developed or migrated from legacy systems, not just the few top-priority ones.

- Employees armed with these apps can, for example, help identify facilities issues more quickly and accurately, so a repair person can be sent out faster, and with the right parts and tools to reduce time and costs.
- Revenue-generating apps (whether customer self-service apps or sales enablement tools for sales reps to use in customer discussions) can help generate new revenue and profit.
- Solution delivery to customers and continuous innovation are much quicker with Azure PaaS. Applications are developed and tested on the same platform, and applications can be set up and deployed with the push of a button. The organization is also able to send fewer technicians to customer sites to support solution delivery and integration.

› **Applications that are developed for Azure PaaS deployment take less time to develop and test.**

New apps, migrated apps, and updated or upgraded apps all saw improvement in the time required to develop and test them to be ready for production. In particular, significant time and cost is saved in the testing phase. Testers can press a button to create a test environment that exactly matches development and production, so they can start testing immediately and avoid any rework related to testing on an environment that isn’t the same. Testers can also turn off and not pay for the environment when it’s not needed, unlike with on-premises servers.

“We try to adopt the latest cloud-designed patterns and new services Microsoft offers to understand how it could be used and leveraged in existing and future projects.”

~ Senior executive, global eCommerce firm

“For a standard digital project, we don’t even need an infrastructure team anymore for apps running on Azure.”

~ Partner, European consulting firm

BENEFITS

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

- › IT administration resource savings.
- › Avoided and reduced IT resource costs.
- › Improved service deployment time-to-market.
- › Application testing resource savings.
- › Application-enabled organization savings.
- › New business opportunities enabled by Azure PaaS.

“If I was doing this without [Azure] PaaS I would . . . have to care about scaling for every single one of those dozens of websites.”

~ Strategist and founder of a US IT services firm

The organization expects Azure PaaS consumption to grow in later years, as more applications are deployed and managed with those services. An estimated growth rate has been applied for some benefits.



IT Administration Resource Savings

With Azure PaaS, many server tasks for an on-premises or even IaaS implementation are no longer required. These tasks are included in Azure PaaS, as it provides an application platform ready for application deployment, not raw computing resources.

TABLE 1
IT Administration Resource Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
A1	Applications supported by Azure PaaS		100	110	121	133	146
A2	Environments supported per app, before Azure PaaS		3	3	3	3	3
A3	Server buildout/update times per year		2	2	2	2	2
A4	IT administrator mgmt. time required per server (hours)		5	5	5	5	5
A5	Average IT hourly rate	\$58	\$58	\$58	\$58	\$58	\$58
A6	Percentage of IT admin time saved with Azure PaaS	80%	80%	80%	80%	80%	80%
At	IT administration time saved	$A1 * A2 * A3 * A4 * A5 * A6$	\$139,200	\$153,120	\$168,432	\$185,136	\$203,232
	Risk adjustment	↓5%					
Atr	IT administration time saved (risk-adjusted)		\$132,240	\$145,464	\$160,010	\$175,879	\$193,070

Source: Forrester Research, Inc.

"It's very easy to provision new resources from Azure," said the chief technology officer (CTO) at an enterprise content and information management services provider. The CEO of the healthcare software and services provider added: "Let me put it to you this way: We have thousands of service support calls each year. Last year, only 4% of those were attributed to our product line on Azure — about half as many as it would have been."

The representative organization deployed 100 apps in the first year on Azure PaaS, with more apps added in future years due to planned and organic growth. Before Azure PaaS, those apps required multiple environments (production, development, and test), which were each updated about every six months. "If I was doing this without [Azure] PaaS, I would have to spin up a server, and inside the server spin up dozens upon dozens of different websites, which I have to coordinate and manage. I have to care about scaling for every single one of those dozens of websites," said the strategist and founder of the US IT services firm, discussing his portfolio of web applications. The total estimated hours both before Azure PaaS and since are shown in Figure 4.

With Azure PaaS, the organization has seen a significant reduction in time required to manage and support these applications. These savings range from \$139,200 in Year 1 to \$203,232 in Year 5.

Since the time required to manage each application can vary, a small risk adjustment has been applied. The risk-adjusted annual benefits range from \$132,240 in Year 1 to \$193,070 in Year 5. See the section on Risks for more information.



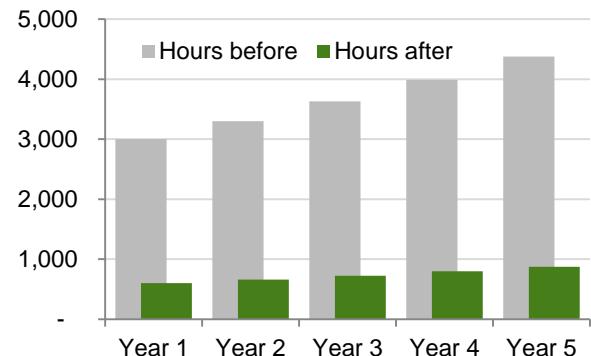
Avoided And Reduced IT Resource Costs

With the time savings enabled by Azure PaaS, applications can be developed and tested more quickly, often with less complexity. Services such as Azure SQL Database and Azure Active Directory can help simplify the coding and testing of applications, avoiding the need for high-skilled future hires.

Azure SQL Database can also enable easier data management, so the organization can focus on *using* data rather than dealing with indexes and other data management tasks. "We don't have large IT, IT ops, and developer ops teams; we're going to do everything as efficiently as possible," said the chief architect at a BI solution provider. "If we were doing this in our own data center, I'd need to hire several DBAs, DevOps, and systems networking people."

The organization developed several key apps on Azure PaaS. It estimated that these apps not only saved considerable time but also helped avoid extra resources, such as a dedicated IT manager or DBA. The organization estimates it would have needed to hire five IT resources and two DBAs within a year of developing key applications without Azure PaaS. With

FIGURE 4
IT Resource Hours Saved With Azure PaaS



Source: Forrester Research, Inc.

"We don't have large IT, IT ops, and developer ops teams; we're going to do everything as efficiently as possible."

~ Chief architect at a BI solution provider

Azure PaaS, it is able to avoid the cost of hiring those people; or, if they are already hired, it could reassign them to a higher priority project (thus avoiding the need to hire more people for that project). These resource savings add up to \$820,000 each year.

TABLE 2
Avoided And Reduced IT Resource Costs

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
B1	IT FTE headcount reallocated or avoided with Azure PaaS		5.0	5.0	5.0	5.0	5.0
B2	DBA FTE headcount reallocated or avoided with Azure PaaS		2.0	2.0	2.0	2.0	2.0
B3	IT admin annual salary (average)		\$120,000	\$120,000	\$120,000	\$120,000	\$120,000
B4	DBA annual salary (average)		\$110,000	\$110,000	\$110,000	\$110,000	\$110,000
Bt	Avoided and reduced headcount costs	B1*B3 + B2*B4	\$820,000	\$820,000	\$820,000	\$820,000	\$820,000
	Risk adjustment	↓15%					
Btr	Avoided and reduced headcount costs (risk-adjusted)		\$697,000	\$697,000	\$697,000	\$697,000	\$697,000

Source: Forrester Research, Inc.

Since salaries can vary, a risk adjustment has been applied. The risk-adjusted annual benefit is \$697,000 per year. See the section on Risks for more information about Forrester's TEI approach to risk adjustment.



Improved Service Deployment Time-To-Market

The representative organization also sells and deploys software solutions to its customers via the cloud. Using Azure PaaS, it can deliver improved services to its customers without having to manage and support on-premises server deployment projects; it can also deliver service updates and patches much more quickly and reliably. The organization has seen significant deployment time savings, allowing it to deliver software and services much more quickly, leading to a significant increase in revenue and profit.

Interviewed organizations highlighted a number of pains they can now avoid (such as on-premises infrastructure testing and implementation) to help improve the business and lead to greater customer satisfaction:

- “We were working with a client, and it took them six months to give us a test server. [With Azure] I can have a test server in 10 minutes — or, you know, pretty much any feature in 10 minutes,” said the chief architect of the BI solution provider. “For any on-premises project, we’d have to add a month to two months for deployment.”
- “We were pitching our solution to a client, and it took only 2 hours to get it up and running [with Azure]. It’s not even about saving working hours, but being able to do something today and not in two and a half weeks. That makes a huge difference when you’re competing for a client win,” said the CTO at an enterprise and information content services provider.
- “Within the new Azure app service, you can have deployment literally in seconds,” said the partner at a European consultancy.

Being able to deploy software and services more quickly can lead to a number of benefits, such as improved customer satisfaction and increased resource productivity. Increased revenue and profit is used as the summary metric enabled by these improvements. The organization estimates that before Azure PaaS, it conducted 20 deployments per year, but with Azure PaaS it could support more deployments (met with an increase in sales efforts). Delivering each application two weeks sooner leads to added revenue, now that its product can be licensed as an ongoing subscription. The benefit is the total profit gained from all net-new deployments (that the organization previously didn't have time to get to as quickly), plus the incremental profit gained from faster deployments. This ranges from \$501,921 in Year 1 to \$1,156,151 in Year 5. Ongoing patching and update delivery is also much easier to manage with Azure, though this was not quantified. Ensuring most or all customers are on the latest software can help reduce security and technical support questions, and not having to send as many support technicians (or even any at all) to a customer location saves significant time and travel expenses.

TABLE 3
Improved Customer Application Service Deployment Time-To-Market

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
C1	New customer service deployments per year		20	30	33	36	40	44
C2	Customer deployment time (weeks)		4	2	2	2	2	2
C3	Revenue per new customer deployment per year (estimated)		\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
C4	Revenue per customer per week		\$5,769	\$5,769	\$5,769	\$5,769	\$5,769	\$5,769
C5	Profit margin		15%	15%	15%	15%	15%	15%
Ct	Deployment time for revenue improvement with Azure PaaS	$((C1 \text{ growth}) * C3 + C1 * (C2 \text{ reduction}) * C4) * C5$	\$0	\$501,921	\$642,113	\$782,305	\$969,228	\$1,156,151
	Risk adjustment	↓25%						
Ctr	Deployment time for revenue improvement with Azure PaaS (risk-adjusted)		\$0	\$376,441	\$481,585	\$586,729	\$726,921	\$867,113

Source: Forrester Research, Inc.

Given the broad range of revenue per project and the number of influences that can affect revenue beyond delivering a cloud solution, a high risk adjustment has been applied. The risk-adjusted totals range from \$376,441 in Year 1 to \$867,113 in Year 5. See the section on Risks for more information about Forrester's TEI approach to risk adjustment.

Application Testing Resource Savings

With Azure PaaS, developers and testers can quickly create a development or testing platform configured to be exactly the same as their production environment. “I think probably the biggest cost in terms of testers’ time is to

conduct regression testing on the app when the production environment changes,” said the senior executive of the global eCommerce firm.

First, the spin-up process itself is much faster than before — even the previous IaaS environment required specific computing setup steps for dev and test, and may or may not have included all the same settings and interactions as the production environment. Second, with identical development, test, and production environments, application errors related to platform changes are all but eliminated.

The representative organization had already migrated to Azure IaaS from its previous on-premises solution, so savings there have already been realized and are not included in this analysis. Organizations might include cost savings related to retiring on-premises infrastructure.

Given a wide variety of applications and resources, the organization estimates it saves an average of 25 hours for each application developed, tested, and then deployed on Azure PaaS. It’s assumed that most of that time is for testing and a smaller portion is for development. That adds up to \$114,167 worth of development and testing time saved in Year 1 and increases to \$166,683 in Year 5.

Since applications vary in complexity and the hours saved per application are likely to average a broad range, a risk adjustment has been applied. The risk-adjusted annual benefits range from \$108,458 in Year 1 to \$158,349 in Year 5. See the section on Risks for more information about Forrester’s TEI approach to risk adjustment.

TABLE 4
Application Testing Resource Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
D1	Azure PaaS apps upgraded or developed per year		100	110	121	133	146
D2	Development and test time reduced with Azure PaaS		25	25	25	25	25
D3	App tester hourly rate		\$36	\$36	\$36	\$36	\$36
D4	App developer hourly rate		\$65	\$65	\$65	\$65	\$65
Dt	App development and testing time saved with Azure PaaS	D1 * D2 * ((2/3) * D3+(1/3)*D4)	\$114,167	\$125,583	\$138,142	\$151,842	\$166,683
	Risk adjustment	↓5%					
Dtr	Application testing resource savings (risk-adjusted)		\$108,458	\$119,304	\$131,235	\$144,250	\$158,349

Source: Forrester Research, Inc.

“I think probably the biggest cost in terms of testers’ time is to conduct regression testing on the app when the production environment changes.”

~ Senior executive, global eCommerce firm



Application-Enabled Organization Savings

With Azure PaaS, the organization can develop apps more quickly and easily and integrate those apps with other systems. These applications can enable employees to complete work more quickly or improve the speed and quality of a repetitive process.

TABLE 5
Application-Enabled Organization Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
E1	Employees using app		750	825	908	998	1,098	
E2	Issues logged per day		15	17	19	21	23	
E3	Time to log issue (min.)		10.0					
E4	Improvement in time to log issues		50%					
E5	Time to log issues (min, with PaaS app)	E3 * (1-E4)	5.0	5.0	5.0	5.0	5.0	
E6	Issue processing time (hours, before and now with Azure PaaS)		12.0	4.0	4.0	4.0	4.0	
E7	Issue cycle time (days, before and now with PaaS)		14.0	3.0	3.0	3.0	3.0	
E8	Average repair time (hours)		2.0					
E9	Improvement in repair time		25%					
E10	Time to repair issues (hours, since Azure PaaS app)	E8 * (1-E9)	1.5	1.5	1.5	1.5	1.5	
E11	Average station hourly rate		\$24	\$24	\$24	\$24	\$24	
E12	Average repair employee hourly rate		\$36	\$36	\$36	\$36	\$36	
Et	App-enabled organization savings	E2*365 * ((E3-E5)/60*E11+(E8-E10)*E12)	\$0	\$109,500	\$124,100	\$138,700	\$153,300	\$167,900
	Risk adjustment	↓10%						
Etr	App-enabled organization savings (risk-adjusted)		\$0	\$98,550	\$111,690	\$124,830	\$137,970	\$151,110

Source: Forrester Research, Inc.

One organization interviewed, the transportation agency, highlighted its noncritical facilities issue identification and repair process. It improved this process with a new mobile app that connects to a web application deployed on Azure, connects to an Azure SQL Database, and authenticates with Azure Active Directory. Any time station employees notice a lightbulb burned out, a crack in a tile or window, a scratch in the paint of a bench, graffiti, or any other issue that doesn't affect transportation or commuter safety, they need to report it so it gets fixed. But it's

not a priority — it should be scheduled efficiently, and the repair person needs to bring the right parts and tools along.

The old process involved paper shuffling between stations and the main office, often with confusing handwriting, unclear descriptions, and no visual resources (like a picture). Repair requests were sometimes lost or repair techs arrived only to find they brought the wrong tools or parts. “It was very difficult to communicate the details about a specific asset; ‘the green tile above the red tile in the second hallway’ is difficult to understand when we have stations with tiles of many different colors,” said the IT director at the city transportation authority.

With the organization’s first mobile application, integration with key systems was not cost effective and was limited to a single mobile platform. Fewer requests were lost in the shuffle of paperwork, but there were still problems with poor issue descriptions that meant multiple trips for the technician. With about 15 to 25 issues logged each day (across the 750 to 900 employees working in stations and other public locations), the organization estimated it spent 10 minutes reporting each issue. More importantly, it took 12 hours for an issue to be logged in the issue tracking system, and it could take up to 14 days to resolve the issue. Each issue required an average of 2 hours of repair time, including rework, when employees had to go back for different parts or tools.

With Azure PaaS, the organization has a mobile application that is integrated with useful systems; secure, with App Service and Azure Active Directory authentication; and fully mobile, with offline support so an employee can log an issue even in a subway station with no cell service.

Employees logging an issue are presented a list of assets specific to their location — they can’t just say “green tile;” they select the specific tile type and color. “Each station has maybe 400 to 500 assets that need to be tracked and might be mentioned in an issue report. The app comes with simple drop-downs connected to our asset database for the employee to select,” said the IT director. With the improved information and the ability to look at a picture of the problem, repair techs are much more likely to bring the right tools and parts so they can correctly fix the problem on the first try. The organization estimates it has reduced issue log time by 50%, issue processing cycle time by more than 75%, and repair time by 25%. This has led to station employee and repair tech savings that range from \$109,500 in Year 1 to \$167,900 in Year 5.

Given the variety of repairs and locations, as well as the broader range of tasks a reader’s organization might consider for a similar application, a risk-adjustment has been applied. The risk-adjusted benefits range from \$98,550 in Year 1 to \$151,110 in Year 5. See the section on Risks for more information about Forrester’s TEI approach to risk adjustment.



New Business Opportunities Enabled By Azure PaaS

With service deployment, development, and testing savings enabled by Azure PaaS, applications that affect revenue, such as sales enablement tools and consumer web and mobile applications, are tested and developed more frequently and more quickly. These savings can be measured in terms of the increased revenue collected from an application that would have taken longer to develop or perhaps never would have been developed at all. For the organization, sales were specifically identified as a quantifiable key enabler for increased revenue and profit; other areas of the business have also benefited, but we are not able to quantify these areas at this time.

“It was very difficult to communicate the details about a specific asset [before the Azure-PaaS-enabled application].”

~ IT director at a city transportation authority

Readers should examine their sales opportunities as an obvious source of new revenue, but they should also consider other departments. For example, an HR application might improve hiring processes, or an app focused on a supply chain or manufacturing process might speed up delivery or assembly and improve quality.

Any of these apps could deliver better and faster information to executives, leading to better decisions and more opportunities, such as hiring more-qualified people, expanding scale to more users, opening up new geographies, and deploying additional applications to unlock even greater benefits. Even with an IaaS implementation, the organization may not have been able to take full advantage of new opportunities due to spending too much time and effort on tasks such as setup, management, or technical issues. “Developing our app without PaaS? Well, we wouldn’t have done it. Frankly, the extra time and resources required would have wiped out any profit that we have generated,” said the strategist and founder of the US IT services firm.

TABLE 6
Improved Sales Revenue And Profit From New Applications Migrated To Or Developed On Azure PaaS

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
F1	Large customer projects per year affected by Azure		30	33	36	40	44
F2	Average revenue per project		\$300,000	\$300,000	\$300,000	\$300,000	\$300,000
F3	Improvement with Azure PaaS		15%	15%	15%	15%	15%
F4	Small customer sales generated through Azure PaaS application		10,000	11,000	12,100	13,310	14,641
F5	Average revenue per sale		\$100	\$100	\$100	\$100	\$100
F6	Improvement with Azure PaaS		15%	15%	15%	15%	15%
F7	New revenue as a result of Azure PaaS	$F1 * F2 * F3 + F4 * F5 * F6$	\$1,500,000	\$1,650,000	\$1,801,500	\$1,999,650	\$2,199,615
F8	Profit margin		15%	15%	15%	15%	15%
Ft	Application value enabled	$F7 * F8$	\$225,000	\$247,500	\$270,225	\$299,948	\$329,942
	Risk adjustment	↓25%					
Ftr	Application value enabled (risk-adjusted)		\$168,750	\$185,625	\$202,669	\$224,961	\$247,457

Source: Forrester Research, Inc.

The representative organization identified a customer service enhancement app as a primary opportunity, and since the application was deployed on Azure PaaS, the organization has closed significantly more deals. Sales reps highlight the app as part of their service, and customers appreciate the benefits it provides — many tasks

that previously required personal assistance from the organization can now be managed using self-service tools in the app. And customers also appreciate the account detail and transparency the app provides.

The enterprise content and information management services provider highlighted the global opportunities that have opened up with Azure. The CTO of that firm said: "If Azure didn't have a data center in APAC, I don't think we would have won at least one client because performance and latency is a very important factor. We can just say that we want this to be deployed in Australia or something like that."

The organization estimates 30 to 44 projects sold per year by sales reps selling projects that include the new app on Azure PaaS, and it estimates \$300,000 in revenue per large project. Direct-to-customer sales are also available, estimated at 10,000 to 12,100 transactions per year at \$100 per transaction. A 15% improvement on both types of sales enabled by Azure App Service adds up to \$225,000 of new profit in Year 1 and increases to \$329,942 in Year 5.

As with the deployment time-to-market benefit, there are a number of influences that can have an impact on revenue beyond delivering a cloud solution, so a high risk adjustment has again been applied. The risk-adjusted totals range from \$168,750 in Year 1 to \$247,457 in Year 5. See the section on Risks for more information about Forrester's TEI approach to risk adjustment.

Total Benefits

Table 7 shows the total benefits across the areas listed above, as well as present values (PVs) discounted at 10%. Over five years, the representative organization expects risk-adjusted total benefits to be a PV of more than \$7 million.

TABLE 7
Total Benefits (Risk-Adjusted)

Ref.	Benefit Category	Total	Present Value
Atr	IT administration time saved	\$806,664	\$600,664
Btr	Avoided and reduced headcount costs	\$3,485,000	\$2,642,178
Ctr	Deployment time-to-market improvement with Azure PaaS	\$3,038,789	\$2,215,947
Dtr	Application development and testing time saved	\$661,596	\$492,642
Etr	App-enabled organization savings	\$624,150	\$463,746
Ftr	Application value enabled	\$1,029,461	\$766,389
Total benefits (risk-adjusted)		\$9,645,660	\$7,181,566

Source: Forrester Research, Inc.

COSTS

The representative organization experienced a number of costs associated with the Azure PaaS solution that represent the mix of internal and external costs experienced by the interviewed organizations for initial planning, implementation, and ongoing maintenance associated with the solution:

- Initial and ongoing resource and other costs.
- Azure PaaS subscription costs.



Initial And Ongoing Resource And Other Costs

To maintain its Azure PaaS implementation, as well as the applications deployed on Azure PaaS, the organization allocated time and resources. There were upfront development costs to update and migrate applications to Azure PaaS, as well as resource costs to train, test, and deploy, which were estimated at \$87,000.

As described above, Azure PaaS does not require as many resources as on-premises or IaaS implementations on an ongoing basis. Virtually all server administration tasks are handled by Azure, so the organization can focus its resource needs on application development, testing, deployment, and support. But with the new benefits enabled by Azure, such as access to a variety of data management solutions, the organization has new tasks that it would not have undertaken before, adding up to about half a full-time equivalent (FTE) on average. The estimated resource cost of managing and supporting Azure PaaS is \$60,000 in the first year. Small increases are included each year to support expected application and usage growth.

TABLE 8
Initial And Ongoing Resource And Other Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
G1	Implementation resource costs		\$87,000					
G2	Cost of management resource time required for new Azure PaaS tasks		\$0	\$60,000	\$66,000	\$72,600	\$79,860	\$87,846
G3	Training costs		\$10,000	\$10,000	\$0	\$0	\$0	\$0
G4	Other costs		\$0	\$0	\$0	\$0	\$0	\$0
Gt	Azure PaaS implementation and ramp-up costs	$G1 + G2 + G3 + G4$	\$97,000	\$70,000	\$66,000	\$72,600	\$79,860	\$87,846
Gtr	Risk adjustment	↑5%						
	Azure PaaS implementation and ramp-up costs (risk-adjusted)		\$101,850	\$73,500	\$69,300	\$76,230	\$83,853	\$92,238

Source: Forrester Research, Inc.

Given that resource estimates may be low, a 5% risk adjustment has been applied. The risk-adjusted totals are \$101,850 in initial costs and \$73,500 in Year 1, growing to \$92,238 in Year 5. See the section on Risks for more information about Forrester's TEI approach to risk adjustment.



Azure PaaS Subscription Costs

Azure PaaS subscription costs are a pay-as-you go model where the organization only pays for what it needs and is able to quickly scale up at busy times of the year.

Costs can be paid as part of a variety of licensing agreements. For simplicity, costs are shown as an annual payment for the representative organization, based on estimated pricing for an enterprise with an EA agreement. However, an organization might pay these costs monthly, quarterly, or annually, and they might be part of a multiyear agreement or pay-as-you-go contract. They also might be paid in advance; for this model, we assume the payment is made in the same year as services are consumed.

The representative organization pricing is based on volume licensing pricing (based on interviewed organizations' volume licensing agreements). The pricing is scaled to estimated amounts (including some Azure infrastructure-as-a-service items, such as virtual machines) based on information provided by interviewed organizations.

Azure costs for any organization can be estimated based on (conservative) publicly available pricing with the Azure Pricing Calculator: <https://azure.microsoft.com/en-us/pricing/calculator/>. The organization pays an estimated \$150,000 in Year 1 for Azure services related to the applications covered in the Benefits section. The organization adds \$24,000 in Year 1 for Azure Professional Direct support fees. That adds up to \$174,000 in Year 1 in Azure fees, growing to \$254,753 in Year 5 based on expected growth.

TABLE 9
Annual Azure Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Year 4	Year 5
H1	Azure subscription fees			\$150,000	\$165,000	\$181,500	\$199,650	\$219,615
H2	Azure support/maintenance costs			\$24,000	\$26,400	\$29,040	\$31,944	\$35,138
H3	Other consulting or third-party costs			\$0	\$0	\$0	\$0	\$0
Ht	Azure costs	H1+H2+H3	\$0	\$174,000	\$191,400	\$210,540	\$231,594	\$254,753
	Risk adjustment	↑10%						
Htr	Azure costs (risk-adjusted)		\$0	\$191,400	\$210,540	\$231,594	\$254,753	\$280,229

Source: Forrester Research, Inc.

Primary Azure services include: Azure App Service, SQL Database, Azure Cloud Services, Azure Virtual Machines, Azure AD, and Service Bus. Other services are also included, though at smaller levels for specific needs; these include: DocumentDB, Redis Cache, Traffic Manager, Scheduler, and others.

Since Azure is a pay-per-use service and EA pricing has been modeled, a 10% risk adjustment has been applied in case costs and/or consumption have been underestimated. The risk-adjusted totals range from \$191,400 in

Year 1 to \$280,229 in Year 5. See the section on Risks for more information about Forrester's TEI approach to risk adjustment.

Total Costs

Table 10 shows the total costs as well as associated present values, discounted at 10%. Over five years, the representative organization expects total costs to be a net present value of less than \$1.3 million.

TABLE 10
Total Costs (Risk-Adjusted)

Ref.	Cost Category	Total	Present Value
Gtr	Azure PaaS implementation and ramp-up costs	\$496,971	\$397,759
Htr	Azure subscription costs	\$1,168,516	\$870,000
	Total costs (risk-adjusted)	\$1,665,487	\$1,267,759

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 Azure PaaS 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 B).

The representative organization, based on individual interviews, sees future growth with Azure in two key areas:

- The first area is to expand its Azure investment more broadly across more business departments and migrate more applications. “Our experience working with Azure so far was enough to change all of our [the company leadership] attitudes about waiting on cloud services and Azure. We can probably develop apps at three to 10 times as fast as other companies, because we know what we’re doing in Azure and people don’t yet realize how fast you can develop in Azure,” said the strategist and founder of the US IT services firm.
- The second area is to take advantage of new and improved Azure services as they come online. “Really, those new services being available there next to the existing ones, that’s a fantastic advantage. I think in a year or two that will have an impact as we take the time to learn more about them and start taking advantage of those new opportunities,” said the CTO at an enterprise content and information management services provider.

Taking advantage of either or both of these opportunities in the future could unlock significant revenue and profit, as well as new cost savings opportunities. Investment in these new opportunities would require some added costs, such as new Azure subscription fees, marketing investment, and more resources. In return, several of the benefit and cost savings opportunities highlighted above could be expanded greatly. New benefits could be added to the business case, such as sales in new brand markets or new Azure features that enable new cost savings opportunities.

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 Azure PaaS 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 Azure PaaS, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

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

- IT administration, development, and testing time saved may all be overestimated and/or may involve lower-skilled resources (so the average salary estimate is too high).
- Headcount savings are risk-adjusted to allow for overestimation. For example, time from a resource from another department may still be occasionally required, or salary estimates may be too high.
- Employee savings from internal applications developed on Azure PaaS are risk-adjusted, since other influences may lead to savings. For example, process changes may not have required a new application to be developed and may have been possible even without Azure PaaS.
- For both the “time-to-market” and “application value enabled” benefits, a 25% risk adjustment has been applied. Sales frequency and deal size improvements could be due to other factors, such as increased marketing, product changes, competitor changes, or even broader economic changes that lead to increased spending.

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

- Azure subscription costs and/or consumption may be underestimated.
- Resource and other costs may also be underestimated.

Table 11 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates for the representative organization. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

TABLE 11
Benefit And Cost Risk Adjustments

Benefits	Adjustment
IT administration time saved	↓ 5%
Application development and testing time saved	↓ 5%
Avoided and reduced headcount costs	↓ 15%
App-enabled organization savings	↓ 10%
Time-to-market delivery	↓ 25%
Application value enabled	↓ 25%
Costs	Adjustment
Implementation and ongoing costs	↑ 5%
Azure subscription costs	↑ 10%

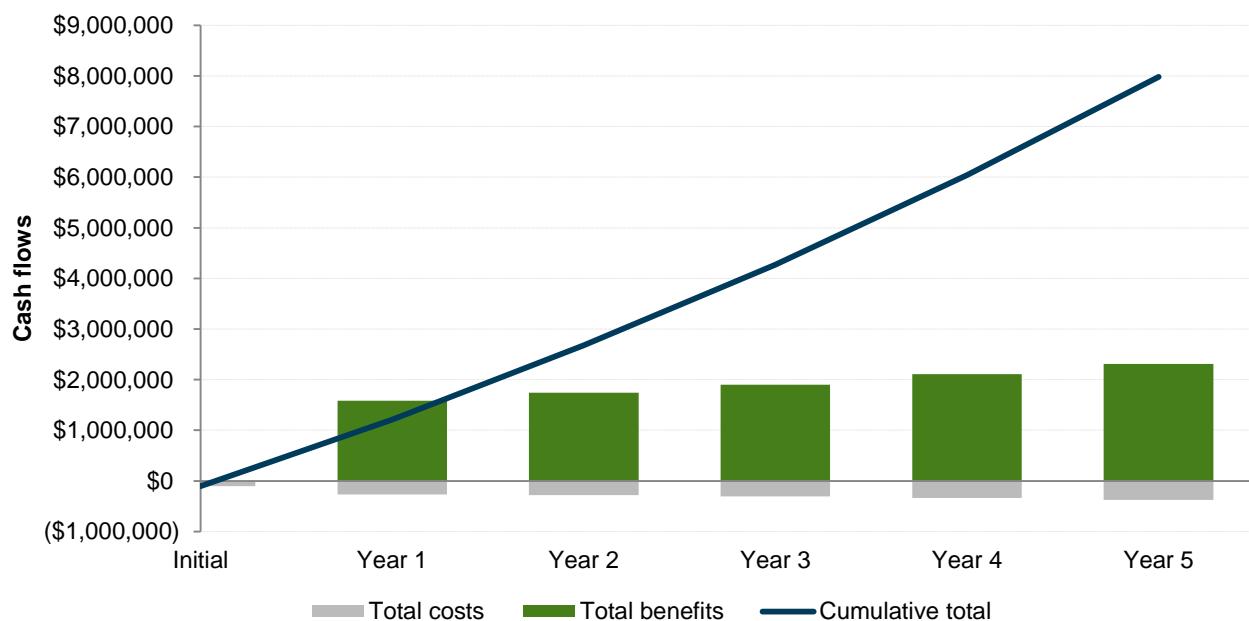
Source: Forrester Research, Inc.

Financial Summary

The financial results calculated in the Benefits and Costs sections can be used to determine the ROI and NPV for the representative organization's investment in Azure PaaS.

Table 12 and Figure 5 show the risk-adjusted summary metrics. These values are determined by applying the risk-adjustment values from Table 11 in the Risks section to the unadjusted results in each relevant cost and benefit section.

FIGURE 5
Cash Flow Chart (Risk-Adjusted)



Source: Forrester Research, Inc.

TABLE 12
Cash Flow (Risk-Adjusted)

Summary	Initial	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Present Value
Costs	(\$101,850)	(\$264,900)	(\$279,840)	(\$307,824)	(\$338,606)	(\$372,467)	(\$1,665,487)	(\$1,267,759)
Benefits	\$0	\$1,581,439	\$1,740,668	\$1,902,472	\$2,106,981	\$2,314,099	\$9,645,660	\$7,181,566
Total	(\$101,850)	\$1,316,539	\$1,460,828	\$1,594,648	\$1,768,374	\$1,941,632	\$7,980,172	\$5,913,807
ROI								466%

Source: Forrester Research, Inc.

Microsoft Azure: Overview

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

Microsoft Azure is an open and flexible cloud platform that enables organizations to quickly build, deploy, and manage applications across a global network of Microsoft-managed data centers, supporting deployment of applications close to customers and users in addition to on-premises and hybrid options.

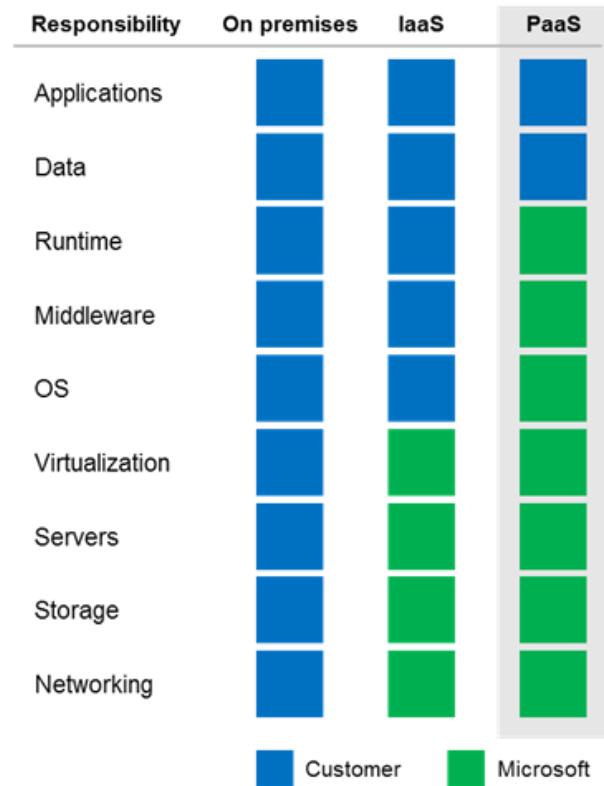
Microsoft Azure enables organizations to build and run applications without focusing on the infrastructure. It provides automatic OS and service patching, built-in network load balancing, and resiliency against hardware failure. It supports a deployment model that enables customers to upgrade applications without downtime.

Microsoft Azure provides open source and cross-platform support across a broad selection of programming languages, frameworks, tools, databases, and architectures, including .NET, Node.js, Java, PHP, and Python. It allows organizations to reliably host and scale out application code, storing data using relational SQL databases and NoSQL data stores, as well as advanced data analytics services, to extract value from all types of data and devices.

Microsoft Azure services like App Service, Service Fabric, Azure Functions, and Cloud Services provide customers with a comprehensive PaaS application platform for building, deploying, and managing apps of all kinds, from the simplest website to the most complex business solution.

Microsoft Azure enables application scaling to any size, with an automated self-service platform that allows for fast resource provisioning and a billing model that charges only for resources used.

For more information, visit www.azure.com.



Source: Microsoft

Appendix A: Representative Organization Description

For this TEI study, Forrester has created a representative organization to illustrate the quantifiable benefits and costs of implementing Azure PaaS. Forrester constructed a TEI framework, a representative company, and an associated ROI analysis that illustrates the areas financially affected, based on interviews conducted with current Azure PaaS customers. The representative organization that Forrester synthesized from these results represents an organization with the following characteristics:

- It is a US-based eCommerce services firm that uses apps deployed via Azure PaaS to assist sales reps.
- It has 2,000 employees, about 750 of whom use one or more internal apps deployed on Azure PaaS.
- The organization has been a consumer of Azure IaaS for several years.
- Azure PaaS was added in the past year.
- It has deployed 100 apps to Azure PaaS, with new and upgraded apps expected to grow that number each year.

In implementing Azure PaaS, the representative company has the following objectives:

- Reduce IT costs.
- Improve application testing and development time and quality.
- Improve internal processes.
- Take advantage of sales and other business opportunities.

For the purpose of the analysis, Forrester assumes that the representative organization is a current Microsoft customer and has implemented Azure IaaS at least one year before PaaS.

FRAMEWORK ASSUMPTIONS

Table 13 provides the model assumptions that Forrester used in this analysis.

The discount rate used in the PV and NPV calculations is 10%, and the time horizon used for the financial modeling is five 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.

TABLE 13
Model Assumptions

Ref.	Metric	Value
I1	Hours per year (M-F, 9-5)	2,080
I2	IT administrator salary	\$120,000
I3	Application developer salary	\$135,000
I4	Application tester salary	\$75,000
I5	DBA salary	\$110,000
I6	Task worker salary	\$50,000
I7	Skilled task worker salary	\$75,000
I8	Profit margin (Azure-enabled sales)	15%

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. 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 enterprise-wide 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

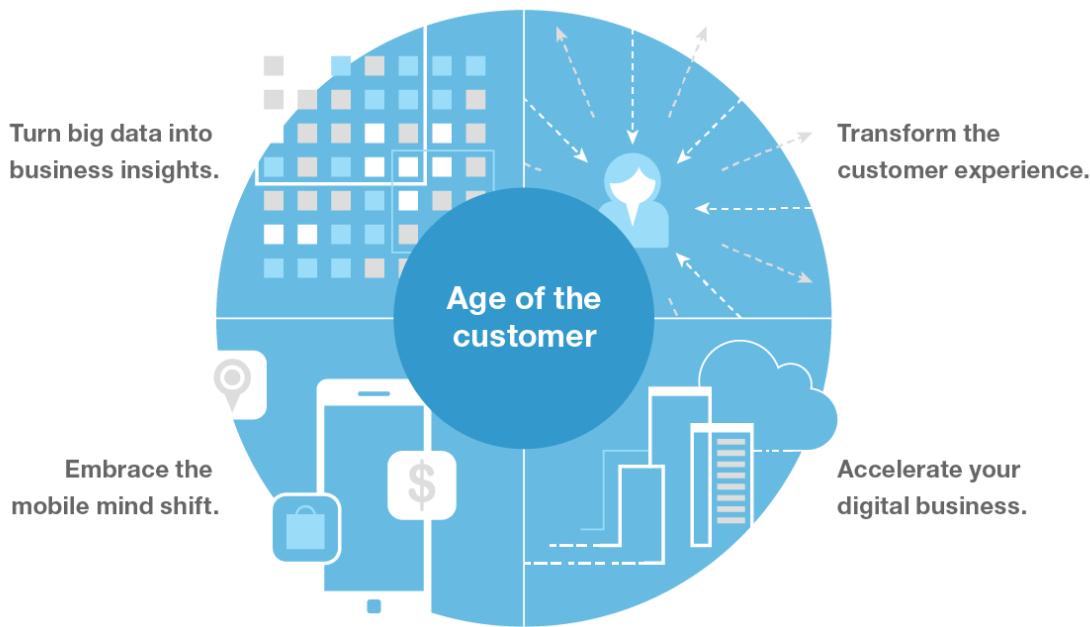
Risks measure the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections and 2) the likelihood that the estimates will be measured and tracked over time.

Appendix C: Forrester And The Age Of The Customer

Your technology-empowered customers now know more than you do about your products and services, pricing, and reputation. Your competitors can copy or undermine the moves you take to compete. The only way to win, serve, and retain customers is to become customer-obsessed.

A customer-obsessed enterprise focuses its strategy, energy, and budget on processes that enhance knowledge of and engagement with customers and prioritizes these over maintaining traditional competitive barriers.

CMOs and CIOs must work together to create this companywide transformation.



Forrester has a four-part blueprint for strategy in the age of the customer, including the following imperatives to help establish new competitive advantages:



Transform the customer experience to gain sustainable competitive advantage.



Accelerate your digital business with new technology strategies that fuel business growth.



Embrace the mobile mind shift by giving customers what they want, when they want it.



Turn (big) data into business insights through innovative analytics.

Appendix D: 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. Not included for cloud solutions.

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 5 are discounted using the discount rate (shown in the Framework Assumptions section) 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.

TABLE [EXAMPLE]
Example Table

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5

Source: Forrester Research, Inc.

Appendix E: 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.