The Total Economic Impact™ Of Microsoft Windows 10

Cost Savings And Business Benefits Enabled By Windows 10

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Table Of Contents

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Executive Summary

Microsoft commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study to examine the benefits organizations may realize after implementing Windows 10. The purpose of this study, the first of two, is to provide readers with a framework to evaluate the potential financial impact of Windows 10. New features and enablers can help improve security, streamline management tasks, and improve employee mobility to help organizations better win, serve, and retain customers.

To understand the benefits, costs, and risks associated with a Windows 10 implementation, Forrester interviewed four customers that have years of experience with Windows, were early adopters of Windows 10, and have completed deployment to key teams.

These organizations leveraged new tools in Windows 10 to deploy the updated operating system (OS) more quickly and easily than past efforts, which provided employees swift access to the latest client technologies to help them get their work done more quickly. Improvements (compared with previous versions of Windows) such as faster boot times, convenient access to corporate applications, increased security, and better mobility tools help IT and users increase productivity and complete work more quickly and effectively. The IT manager for a US professional auto racing team said: "Even our [racecar] drivers have Windows 10 [tablets]; they're reviewing data in the car when they pull in during practice sessions. This makes a difference in how quickly we can gather and analyze data and make decisions."

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>
> ~ IT manager, US professional auto racing team

WINDOWS 10 ENABLES PRODUCTIVITY AND INCREASED BUSINESS PERFORMANCE

Interviews with four existing early-adopter customers and subsequent financial analysis found that a composite organization based on these interviewed organizations experienced the risk-adjusted ROI, benefits, and costs shown in Figure 1.[1] See Appendix A for a description of the composite organization.

The composite organization summarized results in a risk-adjusted three-year analysis. The present value (PV) of benefits is estimated to be $12,366,437 versus the PV of costs of $4,293,159, which adds up to a net present value (NPV) of $8,073,278, or an NPV of more than $400 per user. With Windows 10, IT and employee productivity are improved, and third-party license costs are reduced or eliminated. Desktop security issue remediation time is reduced by one-third, and client managers can recover 20 minutes per day to meet with more clients. Deployment is also significantly faster than past implementations.

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

ROI: 188%	Three-year NPV per user: $404	Payback: 13 months	Deployment: ▼ 4 years to 2

Source: Forrester Research, Inc.

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

- **IT management cost savings.** Windows 10 requires less IT administration time to install, manage, and support, with easy-to-use features and more self-service functions. IT administrators estimate a 15% improvement — valuable time available to help in other key IT areas — adding up to $44,226 to $147,420 saved per year.

- **Convenient application provisioning, leading to $703,125 to $1,125,000 per year in productivity improvements.** With Windows 10 and System Center Configuration Manager (SCCM), the organization is able to provide employees self-service tools to confirm their business need, and then find and install an application.

- **Reduced costs of $202,500 to $648,000 per year from reduced or eliminated third-party software licenses.** With new and improved Windows 10, the organization has reduced the need for some third-party software products.

- **Reduced security remediation costs and reduced security risk, adding up to $221,760 to $709,632 per year.** With new features such as Credential Guard and Device Guard and existing features now improved or enabled by new software and hardware (such as BitLocker), security events requiring IT remediation are reduced or avoided.

- **Improved employee tools and resources that enable more effective customer interactions.** Windows 10's increased mobility and improved wake and boot times enable client service employees to meet more clients. PCs boot up in less than 5 minutes, versus waiting 20 minutes for their PC to boot up and log into key systems.

- **Improved user productivity, adding up to $982,800 to $3.12 million per year.** Employees, especially mobile workers, estimate they can take advantage of 25% of time previously unavailable for work, enabling them to get more done more quickly wherever they may be.

- **Quicker and easier deployments compared with earlier upgrades.** One large organization recently completed a four-year upgrade to Windows 7 and expects to deploy Windows 10 in less than half that time.

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

- **Initial planning and implementation costs.** The organization's $1,646,190 in upfront costs includes resource time for planning, training, application testing, piloting, and other implementation tasks, as well as some new device purchases costs.

- **Implementation costs for later deployment rollout.** After the initial planning and deployment, more client devices will be updated (or replaced) in later years, which is estimated to add up to $1,451,888 to $1,507,013 per year.

- **Other ongoing costs of $13,230 to $44,100 per year.** Windows 10 includes some new features; even though they result in significant overall IT management time savings, they also add some new task management time.

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 Windows 10.

› 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.

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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 Windows 10. 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 Windows 10 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 Windows 10 and the marketplace for Windows 10.

› Interviewed four organizations currently using Microsoft Windows 10 to obtain data with respect to costs, benefits, and risks.

› Designed a 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 composite 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 Windows 10's service: 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

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

Source: Forrester Research, Inc.

Analysis

COMPOSITE ORGANIZATION

For this study, Forrester conducted four interviews with representatives from the following companies, which are Windows 10 early adopters: a national government public health department, a multinational food and beverage conglomerate, a global IT services firm, and a professional auto racing team in the US.

Based on the interviews, Forrester constructed a TEI framework and an associated ROI analysis that illustrates the areas financially affected. The composite organization that Forrester synthesized from these results represents an organization with the following characteristics. (See Appendix B for more details and assumptions regarding the composite organization.)

› It is a US-based organization with a global presence and a large number of mobile workers.

› It has 20,000 employees and 24,000 Windows client devices (tablets, laptops, and desktops).

› The previous operating system standard was Windows 7. Some devices, primarily tablets and laptops, had Windows 8.1.

› Implementation started in late 2015, and 7,500 clients were deployed by early 2016; completion is expected by the end of 2017.

INTERVIEW HIGHLIGHTS

Four organizations that were early adopters of Windows 10 were interviewed for this study. The organizations, summarized as a composite organization, identified the following opportunities and benefits.

Situation

Based on individual interview responses, decision-makers at the composite organization saw the following issues, drivers, and opportunities leading up to its decision to deploy Windows 10:

› Deploy to client devices more quickly than in the past.

› Reduce IT management task time.

› Reduce or eliminate unnecessary costs.

› Enable business users to deliver greater value.

› Improve security.

› Improve productivity.

Results

The interviews revealed that:

› **IT costs are reduced with Windows 10.** Administration, security management, and client support resource time are reduced. Some Windows 10 features also deliver key capabilities that can save costs for a third-party software solution.

› **End user productivity is increased.** Employees are able to get more work done with Windows 10. End users can handle simple IT tasks (such as installing software or resetting a password) on their own, and are also able to leverage the touch-enabled Windows 10 operating system and the latest devices and form factors to get more work done in mobile settings.

› **Windows 10 was easier and quicker to deploy compared with earlier operating system upgrades.** Deployment tasks are able to be completed by more end users in a self-service fashion, or by unattended automated IT processes. And even attended installations are much quicker, with fewer clicks needed.

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BENEFITS

Based on the interviews with the first set of early adopters, the composite organization experienced a number of quantified benefits.

› IT productivity and cost savings.

› Application delivery time savings.

› License cost savings for some third-party applications.

› Security issue reduction.

› Client management process improvements.

› Mobile worker productivity.

IT Management Cost Savings And Productivity

Windows 10 helps IT management teams reduce desktop management time and costs. Windows 10 is a familiar interface, so little or no end user training or extra support is required.

TABLE 1
IT Management Cost Savings And Productivity Benefits

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
A1	Number of employees		20,000	31%	100%	100%
A2	Windows 10 devices deployed	A3 * 1.2		7,500	24,000	24,000
A3	Employees with Windows 10 devices	A1 [initial] * A1 [year 1 – year 3]		6,250	20,000	20,000
A4	Number of IT employees		350	350	350	350
A5	Number of IT employees managing client devices		30	30	30	30
A6	Number of IT employees managing Windows 10 devices	A1 * A5		9	30	30
A7	Hours per week before (per employee)		20			
A8	Improvement with Windows 10		15%			
A9	Hours per week saved with Windows 10 (per IT client management employee)	A7 * A8	3			
A10	Average IT hourly rate		$70			
A11	Amount of time saved used for work tasks		50%			
At	Cost savings	A6 * A9 * A10 * A11 * 52	$0	$49,140	$163,800	$163,800
	Risk adjustment	↓10%				
Atr	**Cost savings (risk-adjusted)**		**$0**	**$44,226**	**$147,420**	**$147,420**

Source: Forrester Research, Inc.

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"My end user team reports fewer support calls as the number of Windows 7 machines have reduced and Windows 10 has increased. With Windows 10, there are no calls," said the head of IT for a global IT services firm. "With features like Remote Assistance, there are actually less calls coming through," added the GM of IT services for a national public health department.

Windows 10 also helps reduce IT management time, with new and improved features such as improved security and increased integration with System Center Configuration Manager and Microsoft Intune, as well as other desktop and mobile management solutions. These mobile device management (MDM) capabilities are now built into Windows 10 for PCs and tablets, not just phones, and the organization can manage all types of Windows devices the same way.

"With features like Remote Assistance, there are actually less [support] calls coming through."

~ GM of IT services for a national public health department

The composite organization has a team of 30 people who spend about half their time on client management tasks (for the first year, with only about one-third of devices migrated to Windows 10, and only nine from this team are affected). Compared with previous Windows versions, the organization estimates it has reduced desktop management resource time by 15% for devices that have been upgraded to Windows 10. (By the second and third year, that equates to saving between four and five people — allowing some or all from the desktop management team to take on other important tasks in the IT department.) As shown in Table 1, the organization estimates an average hourly rate for all these team members, adding up to a productivity improvement of $49,140 in Year 1 and $163,800 in years 2 and 3.

A risk-adjustment factor has been applied to reflect the possibility that IT management time or benefits are overestimated. The risk-adjusted totals are shown in Table 1: $44,226 in Year 1 and $147,420 in years 2 and 3. See the section on Risks for more information about Forrester's approach to risk adjustment.

Streamlined Application Delivery And Time Savings

Windows 10 can integrate with tools and services such as System Center Configuration Manager, Microsoft Intune, the Windows App Store, and the new Windows Store for Business. In conjunction with the new Windows Update for Business that helps ensure corporate standards include the latest patches and updates, end users can search and install many applications when they need them. "It's all about the application," said the senior manager of end user technology for a global food and beverage conglomerate. With Windows 10, users can access the right applications from their App Store or other catalogs, and with Active Directory and SCCM integration ensure they are installing the right versions of the right applications based on their role, team, and department.

With self-service tools, the organization estimates it saves significant employee time. End users do not need to wait for IT to respond to their request, and issues such as downloading the wrong version are greatly reduced.

The organization estimates applications from the corporate catalog are downloaded and installed about one to two times per year per employee, on average. With Windows 10, the application request time impact on end users is estimated to reduce from 150 minutes to just 15 minutes, based on the time impact of waiting for IT help and running through a potentially less automated install process. That adds up to $703,125 in productivity time savings in Year 1 and $1,125,000 in years 2 and 3, as shown in Table 2.

Since this benefit applies to a broad group of end users with a variety of skills and needs, a higher risk-adjustment factor has been applied, as the application needs and benefits may be overestimated. The risk-adjusted totals are shown in Table 2: $562,500 in Year 1 and $900,000 in years 2 and 3. See the section on Risks for more information about Forrester's approach to risk adjustment.

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TABLE 2

Streamlined Application Delivery (For Corporate Applications) And Time Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
B1	Employees with Windows 10			6,250	20,000	20,000
B2	Application requests per employee per year			2.0	1.0	1.0
B3	App request time before Windows 10 (min.)			150		
B4	App request time with Windows 10 (min.)			15		
B5	Average IW hourly rate			$50		
B6	Amount of time saved used for work tasks			50%		
Bt	Application delivery	B1 * B2 * (B3 - B4) / 60 * B5 * B6	$0	$703,125	$1,125,000	$1,125,000
	Risk adjustment	↓20%				
Btr	**Application delivery (risk-adjusted)**		**$0**	**$562,500**	**$900,000**	**$900,000**

Source: Forrester Research, Inc.

Reduced Or Avoided Third-Party License Costs

Windows 10 includes new and enhanced features that can take the place of applications that were purchased from a third-party vendor in the past. "We are using Windows Defender now," said the senior IT manager for a food and beverage conglomerate. Drive encryption and antivirus utilities were both identified by several interviewed organizations, along with other applications. The annual license cost for these applications is estimated to add up to about $30 per client device, which can be avoided as the client device is upgraded to Windows 10. Table 3 shows the savings: $225,000 in Year 1 and $720,000 in years 2 and 3.

TABLE 3

Reduced Or Avoided Third-Party License Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
C1	Devices deployed			7,500	24,000	24,000
C2	Third-party license cost savings (annual, per device)			$30	$30	$30
Ct	Third-party license cost savings	C1 * C2	$0	$225,000	$720,000	$720,000
	Risk adjustment	↓10%				
Ctr	**Third-party license cost savings (risk-adjusted)**		**$0**	**$202,500**	**$648,000**	**$648,000**

Source: Forrester Research, Inc.

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A risk-adjustment factor has been applied, as license cost savings may not be as significant. The risk-adjusted totals are also shown in Table 3: $202,500 in Year 1 and $648,000 in years 2 and 3. See the section on Risks for more information about Forrester's approach to risk adjustment.

Reduced Security Issues And Remediation Cost Savings

Windows 10 includes a number of new and improved security features, such as BitLocker, Windows Defender, Windows Hello, Credential Guard, and leveraging virtualization to manage and improve security and encryption even more. The organization has seen that the Windows 10 deployment, along with improved security policies and education, has led to a reduction in security issues requiring remediation (these are typically issues like malware or spyware but are occasionally more significant, such as a lost laptop or missing USB drive). "Windows 10 security enhancements — secure credentials, UEFI capability, and others — help enable or at least enhance how we protect confidential data," said the senior IT manager for a food and beverage conglomerate. The IT manager for a US professional auto racing team added, "Right out of the box, some of the features, like Credential Guard, the virtualization-based security, help Windows 10 to be probably the most secure out-of-the-box Windows Platform."

TABLE 4

Reduced Security Issues And Remediation Cost Savings

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
D1	Number of total Windows clients		24,000			
D2	Number of Windows 10 clients			7,500	24,000	24,000
D3	Number of security issues related to Windows client devices per month, before Windows 10			100	320	320
D4	Time to resolve each issue in hours			10	10	10
D5	Total hours managing security issues, per month	D3 * D4		1,000	3,200	3,200
D6	Reduction in issues and resolution time with Windows 10			33%	33%	33%
D7	Average IT hourly rate			$70	$70	$70
Dt	Security improvements	D5 * D6 * D7 * 12	$0	$277,200	$887,040	$887,040
	Risk adjustment	↓20%				
Dtr	**Security improvements (risk-adjusted)**		**$0**	**$221,760**	**$709,632**	**$709,632**

Source: Forrester Research, Inc.

The IT manager for the professional auto racing team continued by detailing how good security is a desirable benefit (and not just an onerous process) for the organization: "When I started here, I swear it was probably six months to a year that I walked to the engine shop that people were not closing books and putting rags over parts and pieces when I walked through. Well, they didn't know me, and they wanted to make sure that I was going to be here. These guys work very hard for the competitive edge they are trying to obtain for the team. They don't want that information walking out the door."

The organization estimates it experienced an average of 320 security issues per month related to client devices. (For Year 1, that number is lower since it is only based on the portion of issues that would have affected Windows 10 devices only.) With Windows 10, the organization estimates a 33% reduction in issues and resolution time. That adds up to $277,200 saved in Year 1 and $887,040 in years 2 and 3, as shown in Table 4.

Like application delivery, a higher risk-adjustment factor has been applied to adjust for the likely high variance in end user skill and possible benefit impact overestimation (e.g., an employee with more training may recognize phishing and malware more often, avoiding incident). The risk-adjusted totals are also shown in Table 4: $221,760 in Year 1 and $709,632 in years 2 and 3. See the section on Risks for more information about Forrester's approach to risk adjustment.

Client Management Process Improvements

The composite organization identified one specific process that Windows 10 immediately affected. Employees working directly with customers in call centers or in offices for in-person meetings would have to delay their first meeting by 10 or 15 minutes or more while their desktop booted up and they logged in to necessary resources. "Service agents have 15 minutes or more in the morning, to just boot up their systems and to log on so they're ready to either take calls or to service customers. We have reduced that down to less than 2 minutes [with Windows 10]," said the GM of IT services for a national public health department.

While new hardware and single-sign-on services also helped improve client management processes, Windows 10 was a key enabler of faster times from bootup to being ready for customer meetings and calls. The organization estimates a 75% improvement, reducing the amount of time these hourly workers spend coming in early and staying later.

Table 5 shows that this improvement adds up to an annual benefit of $812,500. These results have been risk-adjusted for possible overestimation in boot times and benefit impact. The risk-adjusted totals are also shown: $731,250 per year. See the section on Risks for more information about Forrester's approach to risk adjustment.

TABLE 5

Client Management Process Improvements

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
E1	Client service employees			625	625	625
E2	Time spent waiting for bootup and restarts each day (minutes) before Windows 10		20			
E3	Time spent waiting for bootup and restarts each day (minutes) since Windows 10			5	5	5
E4	Average client service hourly rate			$40		
E5	Amount of time saved used for work tasks			50%		
Et	Business benefits	E1 * (E2-E3) / 60 * E4 * 260 * E5	$0	$812,500	$812,500	$812,500
	Risk adjustment	↓10%				
Etr	**Business benefits (risk-adjusted)**		**$0**	**$731,250**	**$731,250**	**$731,250**

Source: Forrester Research, Inc.

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Mobility Worker Productivity

In addition to improvements in the specific business process outlined in the last section, the organization has experienced an overall improvement in employee productivity. Windows 10 leverages the latest mobile form factor features — touchscreen, pen, and other user features — with the latest security integration tools, including BitLocker, VPN, enterprise mobile management, and others. That allows mobile employees to find more ways and more times to use their devices and meet the necessary security requirements to be able to access corporate resources.

TABLE 6
Mobile Worker Productivity

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
F1	Windows 10 users			6,250	20,000	20,000
F2	Percent of Windows 10 users who are often mobile (e.g., "road warriors")			10%	10%	10%
F3	Mobile Windows 10 users	F1 * F2 (rounded)		630	2,000	2,000
F4	Percent of mobile user time spent on device-intensive tasks affected by Windows 10			15%	15%	15%
F5	Improvement in productivity with Windows 10			25%	25%	25%
F6	Average IW employee salary per hour			$50	$50	$50
F7	Percent of time recovered for work-related tasks			50%	50%	50%
Ft	Mobile worker productivity	F3 * F4 * F5 * F6 * 2080	$0	$1,228,500	$3,900,000	$3,900,000
	Risk adjustment	↓20%				
Ftr	**Mobile worker productivity (risk-adjusted)**		**$0**	**$982,800**	**$3,120,000**	**$3,120,000**

Source: Forrester Research, Inc.

The organization estimates that 10% of its employees are heavy mobile users. These users spend 15% of their time in situations where they need to get work done or access a resource but are not able to. (This could be related to directly needing to get something done, like participate in a call, review a document, or do another task that would be delayed until they were back at a better location, such as the office. This could also be related to extra time spent remediating an issue or delay, such as providing a quote for a product that is no longer in stock.)

The global IT services firm highlighted another key employee benefit: Their professionals work on a project at a client site, and then once that project is complete, they move to a new project and a new client site. The head of IT for a global IT services firm summarized his team's tasks: "The team spends a good amount of time and effort deleting the data which was created by an employee in the first project. And then when he moves on to the next project, we have to recreate another environment for him from scratch, which also means deploying and configuring different sets of software on his machine." With Windows 10, the organization is ready to fully leverage virtualization for these employees, to help speed up their ramp-up and close project tasks. Before, they would have to wipe the hard drive and reinstall a new OS, install the correct applications, connect to the proper

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domain, and complete other initiation tasks. With Windows 10 and the latest device technology, the organization can quickly re-provision devices that are clean, secure, encrypted, and ensure data separation, to match client requirements without affecting device performance. Employees who work onsite at a client location can connect to their network securely and get to work. The global IT services firm estimates this task alone took three days to complete (meaning the IT employee was not working on a project for that time), and now it takes just a few hours, mainly to enact and confirm data destruction policies to clients' satisfaction.
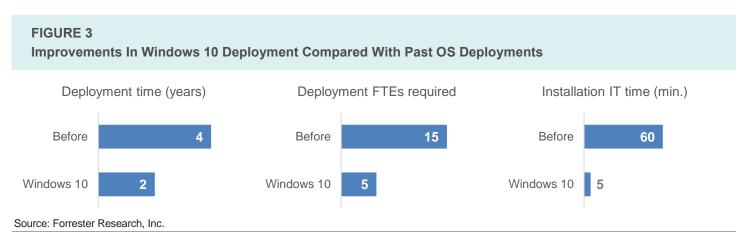
Overall, with Windows 10, the organization estimates it has improved mobile worker productivity by 25%, which adds up to $1,228,500 in Year 1 and $3.9 million in years 2 and 3, as shown in Table 6.

"Mobile worker" is a broad category covering many roles, including roles that do not have an impact on sales and revenue as much as a direct sales representative might. A risk-adjustment factor has been applied to reflect the possibility that the benefit for these users is overestimated. The risk-adjusted totals are also shown in Table 6: $982,800 in Year 1 and $3.12 million in years 2 and 3. See the section on Risks for more information about Forrester's approach to risk adjustment.

Deployment Impact

Windows OS deployment was not a savings that affected ROI, but the investment cost of planning for and deploying Windows 10 was much lower than expected and compared with previous OS deployments. "It was a much easier migration to Windows 10 as compared to Windows 7 and 8," said the head of IT for a global IT services firm.

FIGURE 3

Improvements In Windows 10 Deployment Compared With Past OS Deployments

Deployment time (years)	Deployment FTEs required	Installation IT time (min.)
Before: 4	Before: 15	Before: 60
Windows 10: 2	Windows 10: 5	Windows 10: 5

Source: Forrester Research, Inc.

Most importantly, the organization estimates that its previous deployment took four years, while Windows 10 will take less than two. This significantly reduces IT costs and accelerates the impact of benefits; both are reflected in the benefit calculations above. The GM of IT services for a national public health department summarized how quickly the organization was able to deploy Windows 10 (which it started in early November 2015): "By the end of November, we already had over a thousand employees that had upgraded with the self-serve option. In December, we moved well past 25% of all employees once we started overnight, unattended upgrades. It gives you an idea of how quickly we can deploy."

The organization can also save installation time for new hardware purchases — with its volume licensing program that includes Software Assurance, the organization has standardized on Windows 10 Enterprise edition. The organization, with the correct authorization and license keys, can "flip the bit" to enable Enterprise edition on new desktops, laptops, and tablets without reimaging the devices received from hardware vendors ("OEMs").

Figure 3 shows a summary of Windows 10 deployment efforts compared with past OS deployments. The organization also estimates that IT effort required for OS deployment has reduced from nearly an hour to just 5

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minutes on average per client device, due to increased self-service installation, unattended installation, and integration with System Center Configuration Manager, enabling the IT team to automate deployment by "waking" client devices overnight and initiating installation. "For the Windows 7 program over the course of years, we would have had hundreds of people at any one time engaged against it," said the GM of IT services for the public health department, "[With Windows 10], the upgrade has been very seamless, and we achieved this with the core team of five people."

Deployment time is expected to be two years or less, though past deployments were longer not just because the effort was greater but also because the organization deployed both software and hardware updates at the same time. Full-time-equivalent (FTE) resource needs throughout deployment are also much lower (including the one interviewed organization that mentioned the deployment team was in the "hundreds of people"). And the time required to manage a Windows 10 installation (per device) is much lower, with improved installation processes, increased SCCM integration, Enterprise edition enablement by the OEM, and more self-service user installation.

"By the end of November, we already had over a thousand employees that had upgraded with the self-serve option. In December, we moved well past 25% of all employees once we started overnight, unattended upgrades."

~ GM of IT services, national public health department

Total Benefits

Table 7 shows the total of all benefits across the areas listed above, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of $12,366,437, which equates to a PV of $618 in benefits per employee.

TABLE 7
Total Benefits (Risk-Adjusted)

Ref.	Benefit Category	Initial	Year 1	Year 2	Year 3	Total	Present Value
Atr	Cost savings	$0	$44,226	$147,420	$147,420	$339,066	$272,799
Btr	Application delivery	$0	$562,500	$900,000	$900,000	$2,362,500	$1,931,349
Ctr	Third-party license cost savings	$0	$202,500	$648,000	$648,000	$1,498,500	$1,206,480
Dtr	Security improvements	$0	$221,760	$709,632	$709,632	$1,641,024	$1,321,230
Etr	Business benefits	$0	$731,250	$731,250	$731,250	$2,193,750	$1,818,511
Ftr	Mobile worker productivity	$0	$982,800	$3,120,000	$3,120,000	$7,222,800	$5,816,069
	Total benefits (risk-adjusted)	**$0**	**$2,745,036**	**$6,256,302**	**$6,256,302**	**$15,257,640**	**$12,366,437**

Source: Forrester Research, Inc.

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COSTS

The composite organization experienced a number of costs associated with the Windows 10 solution:

› Initial planning and implementation costs. The organization spent time to:

- Plan the full deployment process.

- Get trained on new features and tools.

- Test applications.

- Assess current hardware needs.

- Purchase new hardware where necessary.

› Annual costs for ongoing deployment. This includes some additional hardware purchase costs, as well as the effort to deploy Windows 10 to new and existing devices.

› Other costs, including some minimal time required to handle the management and support of new Windows 10 features.

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

Initial Planning And Implementation Costs

In the months leading up to the start of Windows 10 deployment, the organization spent time planning the full deployment process, getting trained on new features and tools, testing applications, assessing current hardware needs, and purchasing new hardware where necessary.

TABLE 8
Initial Planning And Implementation Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
G1	New desktops, laptops, or Windows tablets purchased		940			
G2	Average cost per new device		$1,300			
G3	Planning and implementation FTE		5			
G4	Planning and implementation hours (total)		4,940			
G5	Planning and implementation FTE hourly rate		$70			
Gt	Initial planning and implementation costs	G1 * G2 + G4 * G5	$1,567,800	$0	$0	$0
	Risk adjustment	↑5%				
Gtr	**Initial planning and implementation costs (risk-adjusted)**		**$1,646,190**	**$0**	**$0**	**$0**

Source: Forrester Research, Inc.

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Note that hardware costs are included only for devices that need to be replaced (e.g., too old to recommend using with Windows 10), *and* were purchases that were not already planned as part of the organization's regular hardware refresh cycle. The organization estimates 940 devices need to be replaced outside of normal hardware refresh plans, and those devices cost an average of $1,300 per device.

Also note that Windows 10 software license costs are not included here. The composite organization's (and all interviewed organizations') license software from Microsoft is on a volume licensing plan with Software Assurance, which provides access to new versions.

As highlighted above, Windows 10 deployment was much easier than past operating system upgrades. The organization estimates that much less IT time — just 5 minutes — was required to initiate the upgrade for each device. The whole installation process took longer but was more automated, so the IT or end user employee did not need to sit and wait after starting the process. Many more employees also initiated installation on their own, compared with past OS upgrades. Deployment was conducted during evening and night hours (using Wake on LAN and System Center Configuration Manager, as well as in-person IT resources working late a few evenings), which meant only minimal end user work time was affected.

The new hardware purchases and time requirements are summarized in Table 8, including a risk adjustment to reflect possible underestimation of time or costs. The risk-adjusted initial planning and implementation cost is $1,646,190

Annual Costs For Ongoing Deployment

In Year 1 and Year 2, the organization deployed Windows 10 to more users and also purchased additional out-of-refresh-cycle desktops, laptops, and tablet devices.

TABLE 9

Annual Costs For Ongoing Deployment

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
H1	New desktops, laptops, or Windows tablets purchased			1,030	1,030	
H2	Average cost per new device			$1,300	$1,300	
H3	Windows 10 upgrades deployed to devices			7,500	16,500	
H4	Implementation time per device (min.)			5	5	
H5	Total implementation time (hours)	H3 * H4 / 60		625	1,375	
H6	Implementation FTE hourly rate			$70	$70	
Ht	Future implementation costs	H1 * H2 + H5 * H6	$0	$1,382,750	$1,435,250	$0
	Risk adjustment	↑5%				
Htr	**Future implementation costs (risk-adjusted)**		**$0**	**$1,451,888**	**$1,507,013**	**$0**

Source: Forrester Research, Inc.

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Table 9 summarizes the risk-adjusted totals of $1,451,888 in year 1 and $1,507,013 in year 2; a similar risk adjustment as the previous section applied. With Windows 10, the organization expects to be able to finish deployment for all its employees by the end of Year 2. It is assumed that new hardware is purchased at the end of the previous year (the device purchases in the initial period, above, are used in Year 1; Year 1 purchases are used in Year 2; and Year 2 purchases are used in Year 3). It is assumed that new hardware will also be purchased in Year 3, but for two reasons it is not included in this analysis: 1) the organization should be back to its planned refresh cycle and 2) devices purchased at the end of Year 3 would be used in Year 4 — as Year 4 benefits are beyond the timeframe of this analysis, any costs that might enable benefits in that timeframe are not included either.

Ongoing Management Costs For New Windows 10 Tasks

Windows 10 includes new and improved features that the organization has taken advantage of. It also includes new or increased integration with other tools and features, such as BitLocker. While these tools were available in earlier versions of Windows, the organization had not yet fully implemented them. These require some additional time to manage and support (though that time is much less than the management time savings highlighted in the Benefits section).

Based on the number of Windows 10 devices deployed shown in Table 10, including a risk-adjustment factor as management time may be underestimated, the organization estimates the annual risk-adjusted costs to be $13,230 in Year 1 and $44,100 in years 2 and 3.

TABLE 10

Ongoing Management Costs For New Windows 10 Tasks

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
I1	Windows 10 licenses			7,500	24,000	24,000
I2	Windows 10 license cost			$0		
I3	Windows 10 desktop management FTE			9	30	30
I4	New IT client management task hours/week			0.5		
I5	Desktop management FTE hourly rate			$70		
It	Ongoing costs	I1 * I2 + I3 * I4 * I5 * 40	$0	$12,600	$42,000	$42,000
	Risk adjustment	↑5%				
Itr	**Ongoing costs (risk-adjusted)**		**$0**	**$13,230**	**$44,100**	**$44,100**

Source: Forrester Research, Inc.

Total Costs

Table 11 shows the total of all costs as well as associated present values (PVs), discounted at 10%. Over three years, the composite organization expects total costs to be a PV of $4,293,159, which equates to a PV of $215 in costs per employee.

TABLE 11

Total Costs (Risk-Adjusted)

Ref.	Cost Category	Initial	Year 1	Year 2	Year 3	Total	Present Value
Gtr	Initial planning and implementation costs	$1,646,190	$0	$0	$0	$1,646,190	$1,646,190
Htr	Future implementation costs	$0	$1,451,888	$1,507,013	$0	$2,958,900	$2,565,363
Itr	Ongoing costs	$0	$13,230	$44,100	$44,100	$101,430	$81,607
	Total costs (risk-adjusted)	**$1,646,190**	**$1,465,118**	**$1,551,113**	**$44,100**	**$4,706,520**	**$4,293,159**

Source: Forrester Research, Inc.

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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 Windows 10 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 organization plans to see more value from Windows 10 in the future, as it more broadly adopts additional features:

› Device Guard. The organization can lock down untrusted applications to avoid IT and security issues to gain additional productivity benefits in this area. This is particularly useful for specific groups of employees, such as those who share devices, or for consultants working at client sites where specific and reliable security policies must be maintained.

› Credential Guard. The organization expects to gain greater benefits by further reducing security issues and remediation time with Credential Guard to help limit the severity of many security breaches. The IT manager for a US professional auto racing team said, "Right out of the box some of the features, like Credential Guard . . . help Windows 10 to be probably the most secure out-of-the-box Windows Platform."

› Cortana. The organization hopes to integrate voice commands with Cortana in the future. Mobile workers, drivers, and other employees and partners who are operating machinery or otherwise have their hands full and could greatly benefit from a voice interface to access navigation or communication functions while driving, for example. A voice interface could also help them with other line-of-business tasks that become more important in the future. The GM of IT at a public health department for a national government highlighted a more obvious need that could immediately help: "We're very interested in the use of Cortana. We are looking to see if that can provide a more natural interface for constituents with disabilities who may not necessarily have the dexterity to be able to interact with a keyboard."

› New Windows 10 features. An enduring benefit of leveraging Windows-as-a-service (the final bullet) is the delivery of new features and functions within Windows 10, which the organization hopes will provide greater value across benefit categories included in this study, as well as new areas to be identified.

› Integration with Azure, Intune, and other services. As the organization makes improvements in other areas of its information technology investments, and as Windows 10 improves through service updates, greater opportunities to reduce or avoid IT costs and provide greater user benefits will arise.

› Windows-as-a-service. The organization looks forward to Microsoft's vision of Windows-as-a-service, to help ensure standard updates and patches are applied and to continually provide consistent desktop client devices with the latest technologies. The GM of IT at the public health department highlighted his anticipation for future Windows deployment as a service: "One of the other things that made it cleaner is that we embraced the concept of where Microsoft was going with Windows-as-a-service. So we didn't attempt to customize the OS massively, but instead keep ourselves able to be flexible and agile with what would be coming down the pipe as Microsoft explores their new position as an Agile delivery organization."

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 Windows 10 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 Windows 10, 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

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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 productivity savings are adjusted to reflect potentially overestimated time savings.

› Application delivery savings are more heavily adjusted to reflect the larger, more variable population of employees affected by this benefit. Issue and resolution averages and improvements may be overestimated.

› Third-party cost savings are adjusted to reflect potentially overestimated replaced license costs.

› Security issue savings are more heavily adjusted to reflect, like application delivery savings, the larger, more variable population of employees affected by this benefit. Software installs may be overestimated, and potential support needs may be underestimated.

› Business savings related to client management are adjusted to reflect potentially overestimated boot times and overall time savings.

› Mobile worker productivity is adjusted to reflect potentially overestimated mobile worker mobile needs and benefits.

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

› Windows 10 initial planning and implementation costs and annual implementation costs are adjusted a small amount to reflect possibly underestimated time requirements.

› Windows 10 new management tasks are adjusted to compensate for underestimated time requirements, though this is considered a low impact.
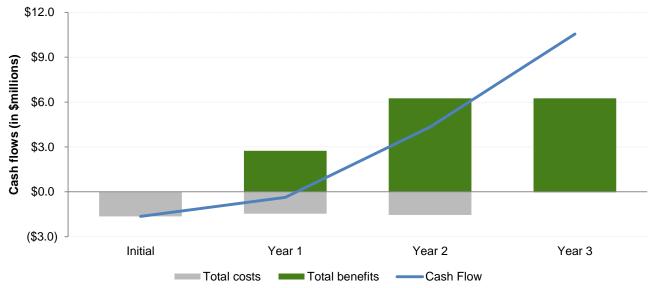
Table 12 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates for the composite organization. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

TABLE 12
Benefit And Cost Risk Adjustments

Benefits	Adjustment
IT productivity and cost savings	↓ 10%
Application delivery time savings	↓ 20%
Third-party license cost savings	↓ 10%
Security issue reduction	↓ 20%
Business benefits	↓ 10%
Mobile worker productivity	↓ 20%

Costs	Adjustment
Windows 10 initial planning and implementation costs	↑ 5%
Windows 10 annual implementation costs	↑ 5%
Ongoing management costs	↑ 5%

Source: Forrester Research, Inc.

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Financial Summary

The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment in Windows 10.

Table 13 and Figure 4 show the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 12 in the Risks section to the unadjusted results in each relevant cost and benefit section. The total NPV of $8,073,278 can also be viewed as an NPV of more than $400 per employee.

FIGURE 4

Cash Flow Chart (Risk-Adjusted)

Source: Forrester Research, Inc.

TABLE 13

Cash Flow (Risk-Adjusted)

	Initial	Year 1	Year 2	Year 3	Total	Present Value
Costs	($1,646,190)	($1,465,118)	($1,551,113)	($44,100)	($4,706,520)	($4,293,159)
Benefits	$0	$2,745,036	$6,256,302	$6,256,302	$15,257,640	$12,366,437
Net benefits	**($1,646,190)**	**$1,279,919**	**$4,705,190**	**$6,212,202**	**$10,551,120**	**$8,073,278**
ROI						**188%**
Payback period						**13 months**

Source: Forrester Research, Inc.

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Microsoft Windows 10: Overview

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

WINDOWS 10

Windows 10 was designed to help organizations lower TCO by helping IT departments reduce the amount being invested in maintaining the status quo with old infrastructure and processes, so there is more to invest in digital transformation. It was also designed meet and exceed people's productivity requirements as well as deliver on their expectations for more personal computing on the devices they already use, while enhancing the experiences on the new and innovative devices that support touch, ink, and biometrics.

There are four main areas, which are described below, to deliver these promises to organizations and users:

The most **trusted platform** | More **productive** | More **personal** | The most **versatile devices**

THE MOST TRUSTED PLATFORM

Windows has strong defenses to help keep your devices and network secure. It starts with replacing passwords and protecting corporate identities. Using *Windows Hello* and *Microsoft Passport* are the most personal and secure ways to access Windows devices and services today. They provide enterprise-grade security with fingerprint, facial, and iris recognition.

In addition to authentication, Microsoft continues to harden the OS to protect corporate identities such as certificates, tokens, and tickets. In the case of a user's derived credentials (e.g., NTLM hashes), which are those that are issued after authentication and used for single sign-on, these are now protected using hardware-based virtualization to isolate them from attacks, heading off an entire category of attacks that enable lateral movement from the one endpoint to others.

This means that if someone falls victim to an attack, Windows 10 has technologies, such as *Credential Guard*, to help contain the breach and prevent the attacker from moving beyond that device. In the past, attackers could spread across your network from one device using a technique known as "pass the hash." With Windows 10, these attacks (in their current form) no longer work.

Device Guard ensures that only software your IT department has signed is trusted and can run. Even if someone accidently downloads dangerous software, your devices can be protected against it.

MORE PRODUCTIVE

Windows 10 delivers productivity to both IT organizations and company employees.

For IT, as the management landscape changes, Windows 10 helps you to become more cloud enabled — on your terms. Windows 10 has support for *MDM* to help simplify management, as well as *Azure Active Directory (AAD) Join* to enable you

to use the latest in cloud-connected security. It also supports the *Windows Store for Business*, so you can create a curated store experience for your employees to quickly get the apps they need in a self-service manner.

Most organizations today buy a new computer and then send it off to IT to "flatten" it and reload a new image. The process of creating and maintaining those images is expensive. With *dynamic provisioning* in Windows, when the user logs in for the first time with their Azure AD credentials to a brand-new machine, straight out of the box, you can automatically enroll that device in MDM management, push down any policies IT wants to set, change the editions of Windows from Pro to Enterprise, and push down corporate apps. All of this can happen without IT involvement for the user and without deleting any of the drivers or critical machine setup parameters.

For employees with Windows 10, people can create a document on their PC at work, make some edits on the train home, and make a quick update while on the go with their phone. Windows 10 integration with Office 365 and OneDrive for Business makes this seamless.

MORE PERSONAL

Working with Windows 10 feels familiar, whether the situation calls for using a mouse and keyboard, touch, pen and ink, or voice. People are instantly productive without the need for training.

In Windows 10, a 2-in-1 device (such as a Surface Pro or Surface Book) adapts so people get a great mouse and keyboard experience when typing. They can then can shift into a touch-optimized "tablet mode" when the keyboard is removed, which is a feature called *Continuum*.

On many Windows Phones, you can connect a mouse and keyboard as well as a large monitor. In this mode, you see what you would expect on a desktop, get the start menu, and use productivity apps as you would expect. Then when you are done, you disconnect and walk away with your phone. It's like having your PC in your pocket when you need it.

THE MOST VERSATILE DEVICES

Windows 10 is designed to work great on your existing devices. It works with what you have and brings the latest features to your existing hardware. You don't have to wait until your next hardware refresh to start to take advantage of the value of Windows 10.

When you are ready for that hardware refresh, Windows 10 is also ready to light up today's devices. In many cases, getting the most from the latest devices requires strong connections between the operating system and the hardware. The two must work in concert to deliver a seamless and powerful experience.

For more information (and the most recent version of this study) visit http://www.windows.com/business.

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Appendix A: Composite Organization Description

For this TEI study, Forrester has created a composite organization to illustrate the quantifiable benefits and costs of implementing Windows 10, based on interviews with four Windows 10 early adopters. They are a national government public health department, a multinational food and beverage conglomerate, a global IT services firm, and a professional auto racing team in the US. The composite company is based on combined characteristics of the interview participants:

› It is a US-based organization with a global presence and a large number of mobile workers.

› It has 20,000 employees and 24,000 Windows client devices (tablets, laptops, and desktops).

› The previous operating system standard was Windows 7. Some devices, primarily tablets and laptops, had Windows 8.1.

› Implementation started in late 2015, and 7,500 clients were deployed in the first few months; completion is expected by the end of Year 2.

In upgrading to Windows 10, the composite company hoped to reduce IT management task time, reduce or eliminate unnecessary IT and license costs, enable business users to deliver greater value, improve security, and improve IT and general employee productivity.

For the purpose of the analysis, Forrester assumes that the composite organization's current situation includes some of the following characteristics that relate to the Windows 10 business case:

› The composite organization, based on most of the interviewed organizations, is assumed to be a volume license customer that has Software Assurance. Since Software Assurance includes rights to Windows 10 Enterprise edition, no software license costs are included for this Windows 10 analysis.

› The composite organization took advantage of many Windows 7 and Windows 8/8.1 features and enablers, but not all. Since it did not fully implement product features such as BitLocker in the past, some benefit realization is included in this analysis. Even though they are not technically new Windows 10 features, characteristics of the Windows 10 implementation (such as greater SCCM integration and standardization on the single OS) help enable those benefits today and are part of the Windows 10 cost-benefit analysis.

FRAMEWORK ASSUMPTIONS

Table 14 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 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.

This is the first TEI study for Windows 10; updates and new TEI studies are in the planning phases, check back for more information and updates.

TABLE 14
Model Assumptions

Ref.	Metric	Calculation	Value
J1	Hours per year (40-hour work week)	40 * 52	2,080
J2	IT salary (fully burdened)	$70 * 2,080	$146,000
J3	Information worker salary (fully burdened)	$50 * 2,080	$105,000
J4	Cost of new computing device	(Average any new device)	$1,300
J5	Work days per year	52*5	260
J5	Client devices per employee (avg.)		1.2
J6	Standard productivity adjustment factor	(time recovered for work)	50%

Source: Forrester Research, Inc.

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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 enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point. However, having the ability to capture that benefit has a PV that can be estimated. The flexibility component of TEI captures that value.

RISKS

Risks measure the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections and 2) the likelihood that the estimates will be measured and tracked over time. TEI risk factors are based on a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the risk factor around each cost and benefit.
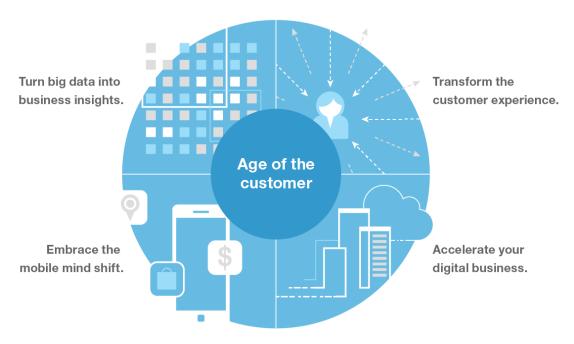
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Appendix C: Forrester And The Age Of The Customer

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.

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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.

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

A NOTE ON CASH FLOW TABLES

The following is a note on the cash flow tables used in this study (see the example table below). The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1. Those costs are not discounted. All other cash flows in years 1 through 3 are discounted using the discount rate (shown in the 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**

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.

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