A Forrester Total Economic Impact™
Study Commissioned By Google
September 2018

The Total Economic Impact™ Of Shared Google Chrome OS Devices

Cost Savings And Business Benefits Enabled By Shared Chrome OS Devices For Enterprise

FORRESTER®

Table Of Contents

Project Director:
Steve Odell

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.

FORRESTER®

Chrome Benefits

Hardware and software cost avoidance:
$1.5 million

Improved employee productivity:
$3.0 million

IT management and services savings:
$477,358

Executive Summary

Google commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by deploying shared Google Chrome OS devices, such as Chromebooks or Chromeboxes. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the shared Chrome OS devices on their organizations.

Google Chrome devices provide organizations a cloud-native and easy-to-deploy alternative to traditional laptops and desktops. For employees using shared devices, this results in easier collaboration, easy device logins, and access and portability of their data from one device to another. To better understand the benefits, costs, and risks associated with this investment, Forrester surveyed 236 organizations and interviewed seven customers with years of experience using Chrome devices.

Forrester developed a composite organization based on data gathered from the customer interviews to reflect the total economic impact that Chrome devices could have on an organization. The composite organization is representative of the organizations that Forrester interviewed and surveyed and is used to present the aggregate financial analysis in this study. All values are reported in risk-adjusted three-year present value (PV) unless otherwise indicated.

Key Findings

Quantified benefits. The following benefits reflect the financial analysis associated with the composite organization.

- **Hardware and software cost avoidance totaling $1.5 million.** Organizations noted that the Chrome hardware and annual enterprise upgrades cost less than their legacy devices.
- **Improved employee productivity totaling $3.0 million.** Organizations noted that due to the cloud-native quality of Chrome devices, employees experienced less device downtime compared to legacy devices. Additionally, employees saw improved productivity from easier collaboration, easy device logins, and access and portability of their data from one device to another.
- **IT management and services savings totaling $477,358.** Organizations noted that Chrome devices required significantly less effort to deploy than legacy devices, and the cloud-native quality of Chrome devices resulted in significantly less IT management and service effort.

Costs. The following costs reflect the financial analysis associated with the composite organization.

- **Hardware and enterprise upgrade costs totaling $983,340.** This is based on a hardware cost of $500 per device and an annual Chrome Enterprise upgrade cost of $50 per device.
- **Deployment costs of $41,400.** In addition to hardware and software costs, organizations noted that, while minimal, there was effort associated with deploying Chrome devices.
- **Training costs totaling $250,125.** Use of Chrome devices can be intuitive. However, since it is a departure from legacy devices, some level of training is required for employees using the shared devices.

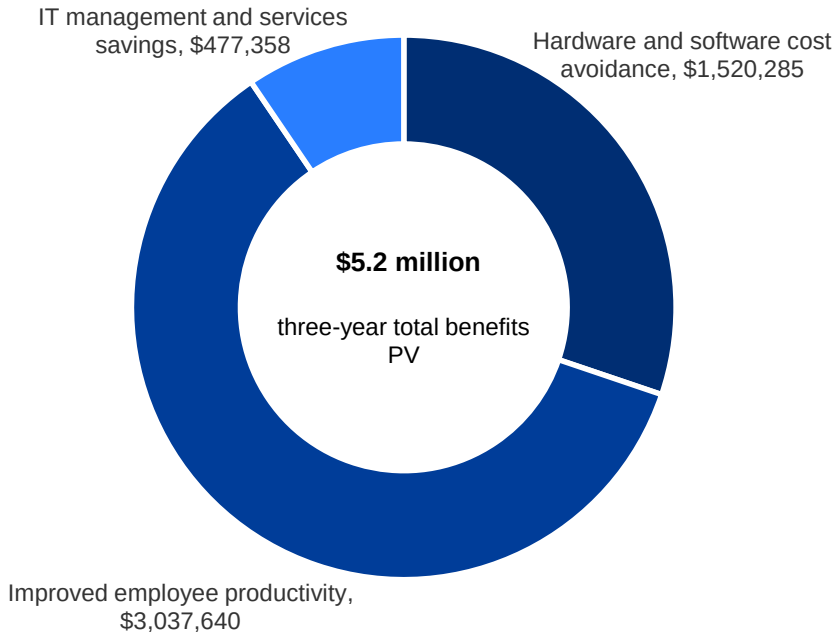
ROI
295%

Benefits PV
$5.0 million

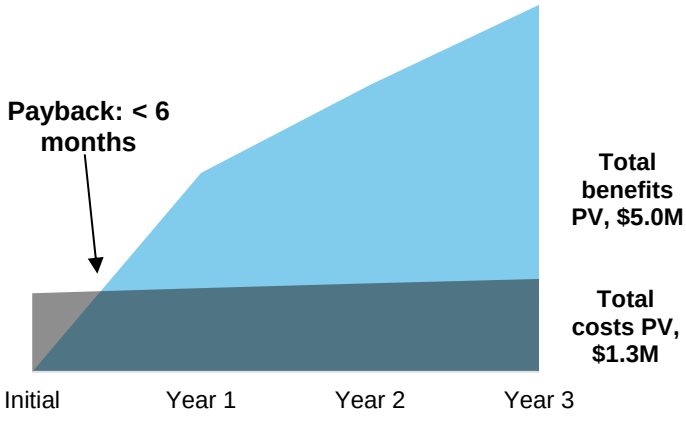
NPV
$3.8 million

Payback
< 6 months

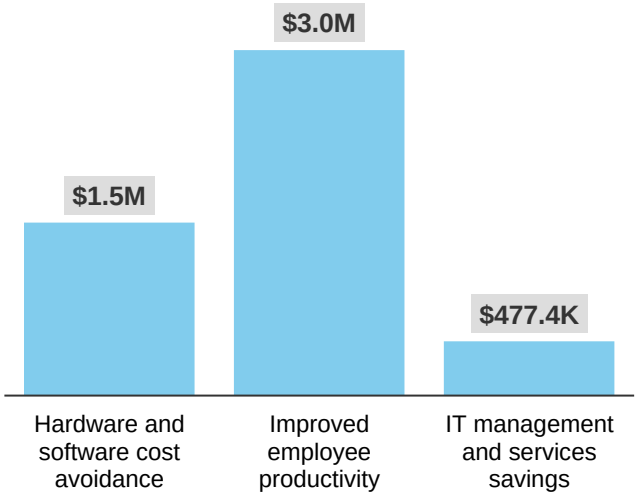
Forrester's survey of and interviews with existing customers and subsequent financial analysis found that a composite organization based on these organizations experienced benefits of $5.0 million over three years versus costs of $1.3 million, adding up to a net present value (NPV) of $3.8 million and an ROI of 295%.



Financial Summary



Benefits (Three-Year)



FORRESTER®

TEI Framework And Methodology

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ (TEI) framework for those organizations considering implementing shared Google Chrome OS devices.

The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Forrester took a multistep approach to evaluate the impact that shared Google Chrome OS devices can have on an organization:

The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

DUE DILIGENCE
Interviewed Google stakeholders and Forrester analysts to gather data relative to shared Chrome OS devices.

CUSTOMER INTERVIEWS
Surveyed 236 organizations and interviewed seven customers using Chrome devices to obtain data with respect to costs, benefits, and risks.

COMPOSITE ORGANIZATION
Designed a composite organization based on characteristics of the interviewed organizations.

FINANCIAL MODEL FRAMEWORK
Constructed a financial model representative of the interviews using the TEI methodology and risk-adjusted the financial model based on issues and concerns of the interviewed organizations.

CASE STUDY
Employed four fundamental elements of TEI in modeling shared Google Chrome OS devices' impact: 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 A for additional information on the TEI methodology.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by Google 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 shared Google Chrome OS devices.

Google reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

Google provided the customer names for the interviews but did not participate in the interviews.

The Shared Chrome OS Devices Customer Journey

BEFORE AND AFTER THE SHARED CHROME OS DEVICES INVESTMENT

Interviewed Organizations

For this study, Forrester surveyed 236 organizations and conducted seven interviews with Google Chrome devices customers. Interviewed customers include the following:

INDUSTRY	NUMBER OF EMPLOYEES	NUMBER OF CHROME DEVICES OR USERS	ANNUAL REVENUE
Healthcare	3,000	3,000	Private
Retail	60,000	15,000	$20 billion
Manufacturing	50,000	30,000	$7 billion
Retail	200,000	35,000	$15 billion
Manufacturing	80,000	70,000	$30 billion
HR consulting	4,000	4,000	Private
Research	1,400	40	Private

Key Challenges

Technology innovation and digital disruption have fundamentally changed how employees access information, collaborate with colleagues, and serve customers. Employees increasingly rely on cloud-based business apps to do their jobs, using the browser as a central access point.[1]

As such, organizations faced some key challenges in their deployments of shared devices, and these led to their investment in Chrome devices. Organizations hoped to improve:

- End user productivity.
- Usability and employee experience.
- IT productivity.

In addition, Forrester's survey across 63 shared Chrome device customers stated the following objectives for choosing Google Chrome devices.

“What drove your organization to move to Chrome devices?”

Base: 63 organizations using shared Google Chrome OS devices

Source: A commissioned study conducted by Forrester Consulting on behalf of Google, February 2018

Key Results

The interviews revealed that the investment in shared Chrome OS devices addressed the challenges organizations were facing and provided additional benefits:

- **Hardware and software cost avoidance.** Organizations noted that the Chrome hardware and annual enterprise upgrades cost less than their legacy devices.
- **Improved employee productivity.** Organizations noted that due to the cloud-native quality of Chrome devices, employees experienced less device downtime compared to legacy devices. This reduced downtime was due to automatic updates and fewer device, security, and server issues.
- **IT management and services savings.** Organizations noted that Chrome devices required significantly less effort to deploy than legacy devices, and the cloud-native quality of Chrome devices resulted in significantly less IT management and service effort.

Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization is representative of the companies that Forrester interviewed and surveyed and is used to present the aggregate financial analysis in the next section. The composite organization that Forrester synthesized from the data has the following characteristics:

Description of composite. The composite organization is a global business with regional offices and locations across multiple countries. The organization has 50,000 total employees, 15,000 of whom use a shared device in their day-to-day work activities, with an average of 10 employees per shared device (1,500 Chrome devices).

The composite organization has 75,000 total endpoints, which consist of desktops, kiosks, tablets, laptops, and mobile devices. The composite organization deployed Chrome browser as its default browser three years ago to support its corporate objective of a cloud-first strategy and has since been deploying other Chrome devices and collaboration solutions.

Key assumptions

- $5 billion annual revenue
- 50,000 employees
- 15,000 employees using shared devices
- 1,500 shared Chrome OS devices

Analysis Of Benefits

QUANTIFIED BENEFIT DATA AS APPLIED TO THE COMPOSITE

Total Benefits

REF.	BENEFIT	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Atr	Hardware and software cost avoidance	$1,425,000	$142,500	$142,500	$1,710,000	$1,520,285
Btr	Improved employee productivity	$1,221,480	$1,221,480	$1,221,480	$3,664,440	$3,037,640
Ctr	IT management and services savings	$356,400	$97,200	$97,200	$550,800	$477,358
	Total benefits (risk-adjusted)	$3,002,880	$1,461,180	$1,461,180	$5,925,240	$5,035,283

Benefit 1: Hardware And Software Cost Avoidance

Organizations noted that the Chrome hardware and annual enterprise upgrades cost less than their legacy devices.

Based on the customer interviews, Forrester estimates:

- The composite organization purchased and deployed 1,500 shared Chrome OS devices, in place of legacy devices.
- Legacy hardware costs averaged $900 per device.
- Legacy annual software licenses costs averaged $100 per device.

This benefit can vary due to uncertainty related to:

- The number of devices that are deployed.
- Average hardware costs of legacy devices.
- Average software license costs for legacy devices.

To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a three-year risk-adjusted total PV of over $1.5 million.

The table above shows the total of all benefits across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to have a PV of over $5.0 million.

Impact risk is the risk that the business or technology needs of the organization may not be met by the investment, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for benefit estimates.

Benefit 1: Hardware And Software Cost Avoidance Calculation Table

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
A1	Number of new devices	Input	1,500	0	0
A2	Number of total devices	$A2_{prior}$+A1	1,500	1,500	1,500
A3	Legacy hardware cost per device	Input	$900	$900	$900
A4	Legacy software license costs per device	Input	$100	$100	$100
At	Hardware and software cost avoidance	A1*A3+A2*A4	$1,500,000	$150,000	$150,000
	Risk adjustment	↓5%			
Atr	Hardware and software cost avoidance (risk-adjusted)		$1,425,000	$142,500	$142,500

Benefit 2: Improved Employee Productivity

Organizations noted that due to the cloud-native quality of Chrome devices, employees experienced less device downtime compared to legacy devices. This reduced downtime was due to automatic updates being applied without requiring applications and the device to shut down first, and fewer device, security, and server issues. Additionally, employees saw improved productivity from easier collaboration, easy device logins, and access and portability of their data from one device to another.

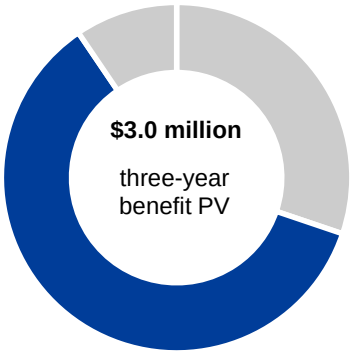
Based on the customer interviews, Forrester estimates:

- The composite organization had 1,500 shared Chrome OS devices in use.
- Workers saved 3 hours for each device each week due to reduced downtime.
- The average fully burdened salary for employees using shared devices was $29/hour.
- Employees captured 20% of the avoided downtime and used it for productive work.

This benefit can vary due to uncertainty related to:

- The number of devices deployed.
- Avoided downtime.
- Employee salary.
- Productivity capture.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding an annual benefit of $1.2 million with a three-year risk-adjusted total PV of over $3.0 million.



Improved employee productivity: **60%** of total benefits

Benefit 2: Improved Employee Productivity Calculation Table

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
B1	Number of total devices	A2	1,500	1,500	1,500
B2	Hours saved per device per week due to reduced downtime from auto-updates and reduced device, security, and server issues	Input	3.0	3.0	3.0
B3	Average fully burdened hourly salary for employees using shared devices	Input	$29	$29	$29
B4	Productivity capture	Forrester assumption	20%	20%	20%
Bt	Improved employee productivity	B1*B2*52*B3*B4	$1,357,200	$1,357,200	$1,357,200
	Risk adjustment	↓10%			
Btr	Improved employee productivity (risk-adjusted)		$1,221,480	$1,221,480	$1,221,480

FORRESTER®

Benefit 3: IT Management And Services Savings

Organizations described the following benefits related to IT management and services savings:

- Chrome devices required significantly less effort to deploy than legacy devices. This included time saved on tasks like imaging laptops, application testing and deployment, policy management, and deployment to individual users.
- The cloud-native quality of Chrome devices resulted in significantly less IT management and service effort related to update policies and end user service desk tickets.

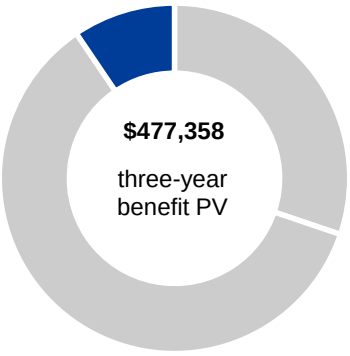
Based on the customer interviews, Forrester estimates:

- The composite organization purchased and deployed 1,500 shared Chrome OS devices, in place of legacy devices.
- Legacy devices required 4 hours to image and deploy initially.
- IT had previously spent 6,000 hours annually managing and servicing legacy shared devices.
- IT productivity improved 75% with Chrome devices.
- IT administrators captured 50% of the improved productivity for more productive work.
- The average fully burdened salary for IT administrators was $48/hour.

This benefit can vary due to uncertainty related to:

- Number of devices deployed.
- Time required to deploy and manage legacy devices.
- Productivity improvement and productivity capture with Chrome devices.
- Average IT administrator fully burdened salary.

To account for these risks, Forrester adjusted this benefit downward by 10%, yielding a three-year risk-adjusted total PV of $477,358.



IT savings:
9% of total benefits

FORRESTER®

Benefit 3: IT Management And Services Savings: Calculation Table					
REF.	**METRIC**	**CALC.**	**YEAR 1**	**YEAR 2**	**YEAR 3**
C1	Number of new devices	A1	1,500	0	0
C2	Deployment time for legacy devices (hours per device)		4	4	4
C3	IT administrator fully burdened hourly rate		$48	$48	$48
C4	*Subtotal: avoided device deployment costs*	*C1*C2*C3*	*$288,000*	*$0*	*$0*
C5	Number of hours IT spent on legacy shared devices		6,000	6,000	6,000
C6	Improved IT productivity with shared Chrome OS devices		75%	75%	75%
C7	Productivity capture		50%	50%	50%
C8	*Subtotal: IT staff improved productivity*	*C5*C6*C7*C3*	*$108,000*	*$108,000*	*$108,000*
Ct	IT management and services savings		$396,000	$108,000	$108,000
	Risk adjustment	↓10%			
Ctr	IT management and services savings (risk-adjusted)		$356,400	$97,200	$97,200

Analysis Of Costs

QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE

Total Costs

REF.	COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Dtr	Hardware and enterprise upgrade costs	$787,500	$78,750	$78,750	$78,750	$1,023,750	$983,340
Etr	Deployment costs	$41,400	$0	$0	$0	$41,400	$41,400
Ftr	Training costs	$250,125	$0	$0	$0	$250,125	$250,125
	Total costs (risk-adjusted)	$1,079,025	$78,750	$78,750	$78,750	$1,315,275	$1,274,865

Cost 1: Hardware And Enterprise Upgrade Costs

Organizations described both hardware and enterprise upgrade costs associated with Chrome devices.

Based on the customer interviews, Forrester estimates for the composite organization:

- Shared Chrome OS devices cost $500 per device, as higher-end functions were typically not required for the work activities performed on shared devices.
- Chrome Enterprise upgrades cost $50 per device annually.

This cost can vary due to uncertainty related to:

- Number of devices deployed.
- Associated hardware and annual enterprise upgrade costs.

To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year risk-adjusted total PV of $983,340.

The table above shows the total of all costs across the areas listed below, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to have a PV of nearly $1.3 million.

Implementation risk is the risk that a proposed investment may deviate from the original or expected requirements, resulting in higher costs than anticipated. The greater the uncertainty, the wider the potential range of outcomes for cost estimates.

Cost 1: Hardware And Enterprise Upgrade Costs Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
D1	Number of new devices	A1	1,500			
D2	Chrome hardware cost per device	Input	$500			
D3	Number of total devices	$D3_{prior}$+D1		1,500	1,500	1,500
D4	Chrome Enterprise upgrade costs per device	Input		$50	$50	$50
Dt	Hardware and enterprise upgrade costs	D1*D2+D3*D4	$750,000	$75,000	$75,000	$75,000
	Risk adjustment	↑5%				
Dtr	Hardware and enterprise upgrade costs (risk-adjusted)		$787,500	$78,750	$78,750	$78,750

Cost 2: Deployment Costs

In addition to hardware and software costs, organizations noted that, while minimal, there was effort associated with deploying Chrome devices.

Based on the customer interviews, Forrester estimates that deployment took 30 minutes per device for the composite organization.

This cost can vary due to uncertainty related to:

- Number of devices.
- Deployment time.
- Average fully burdened salary for IT administrators.

To account for these risks, Forrester adjusted this cost upward by 15%, yielding a risk-adjusted total PV of $41,400.

Cost 2: Deployment Costs Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
E1	Number of new devices	A1	1,500			
E2	Deployment time for Chrome devices (hours per device)	Input	0.5			
E3	IT administrator fully burdened hourly rate	C3	$48			
Et	Deployment costs	E1*E2*E3	$36,000	$0	$0	$0
	Risk adjustment	↑15%				
Etr	Deployment costs (risk-adjusted)		$41,400	$0	$0	$0

Cost 3: Training Costs

Use of Chrome devices can be intuitive. However, since it is a departure from legacy devices, some level of training is required for employees using the shared devices.

Based on the customer interviews, Forrester estimates for the composite organization:

- Ten employees shared each Chrome device.
- Thirty minutes of training were required for each employee.
- The average fully burdened salary for employees using shared devices was $29/hour.

This cost can vary due to uncertainty related to:

- Number of employees using Chrome devices.
- Training required.
- Average fully burdened employee salary.

To account for these risks, Forrester adjusted this cost upward by 15%, yielding a risk-adjusted total PV of $250,125.

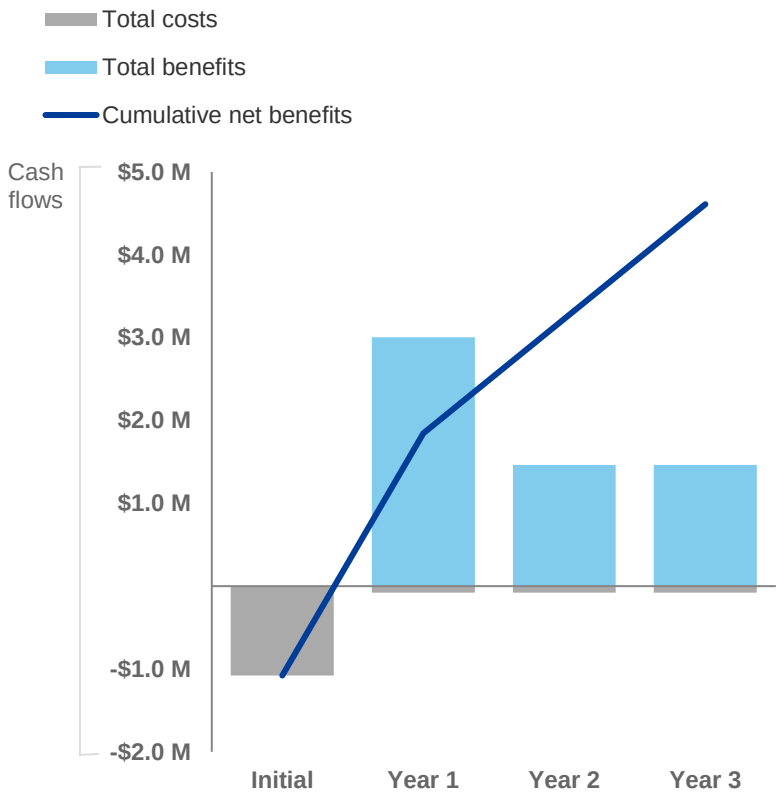
Cost 3: Training Costs Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
F1	Number of employees using shared devices	A1*10	15,000			
F2	Hours of training per employee	Input	0.5			
F3	Average fully burdened hourly salary for employees using shared devices	Input	$29			
Ft	Training costs	F1*F2*F3	$217,500	$0	$0	$0
	Risk adjustment	↑15%				
Ftr	Training costs (risk-adjusted)		$250,125	$0	$0	$0

Financial Summary

CONSOLIDATED THREE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)



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. Forrester assumes a yearly discount rate of 10% for this analysis.

These risk-adjusted ROI, NPV, and payback period values are determined by applying risk-adjustment factors to the unadjusted results in each Benefit and Cost section.

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	TOTAL	PRESENT VALUE
Total costs	($1,079,025)	($78,750)	($78,750)	($78,750)	($1,315,275)	($1,274,865)
Total benefits	$0	$3,002,880	$1,461,180	$1,461,180	$5,925,240	$5,035,283
Net benefits	($1,079,025)	$2,924,130	$1,382,430	$1,382,430	$4,609,965	$3,760,418
ROI						295%
Payback period						< 6 months

FORRESTER®

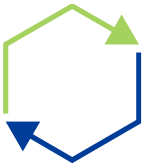
Appendix A: Total Economic Impact

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.

Total Economic Impact Approach

Benefits represent the value delivered to the business by the product. The TEI methodology places 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.

Costs consider all expenses necessary to deliver the proposed value, or benefits, of the product. The cost category within TEI captures incremental costs over the existing environment for ongoing costs associated with the solution.



Flexibility represents the strategic value that can be obtained for some future additional investment building on top of the initial investment already made. Having the ability to capture that benefit has a PV that can be estimated.

Risks measure the uncertainty of benefit and cost estimates given: 1) the likelihood that estimates will meet original projections and 2) the likelihood that estimates will be tracked over time. TEI risk factors are based on "triangular distribution."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in 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.

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.

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.

Return on investment (ROI)

A project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits less costs) by costs.

Discount rate

The interest rate used in cash flow analysis to take into account the time value of money. Organizations typically use discount rates between 8% and 16%.

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.

Appendix B: Endnotes

[1] Source: “Rethink Technology In The Age Of The Cloud Worker,” a commissioned study conducted by Forrester on behalf of Google, May 2018.