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

The Total Economic Impact™ Of Google Chrome OS Devices For Knowledge Workers

Cost Savings And Business Benefits Enabled By Chrome Devices For Knowledge Workers

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Project Director:
Steve Odell

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Chrome Benefits

Hardware and software cost avoidance:
$10.7 million

Improved employee productivity:
$3.1 million

IT management and services savings:
$2.2 million

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 Chrome devices for knowledge workers. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the Chrome devices on their organizations.

Google Chrome devices like Chromebooks and Chromeboxes provide organizations a cloud-native and easy-to-deploy alternative to traditional laptops and desktops. This is significant as employees increasingly rely on cloud-based business applications to do their jobs and need technology that supports productivity at and away from their desks and offices.[1] 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 $10.7 million.** Organizations noted that the Chrome hardware and annual enterprise upgrades cost less than their legacy devices.
- **Improved employee productivity totaling $3.1 million.** Organizations noted that due to the cloud-native quality of Chrome devices, employees experienced less device downtime compared to legacy devices.
- **IT management and services savings totaling $2.2 million.** 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 annual enterprise upgrade costs totaling $6.1 million.** This is based on a hardware cost of $700 per device and an annual Chrome Enterprise Upgrade cost of $50 per device.
- **Deployment costs of $586,500.** In addition to hardware and software costs, organizations noted that, while minimal, there was effort associated with deploying Chrome devices.
- **Training costs totaling $599,150.** Use of Chrome devices can be intuitive, and 94% of information workers say browser-based applications are as easy or easier to use than client apps.[2] However, since their use is a departure from legacy devices, training is required for knowledge workers moving to Chrome devices.

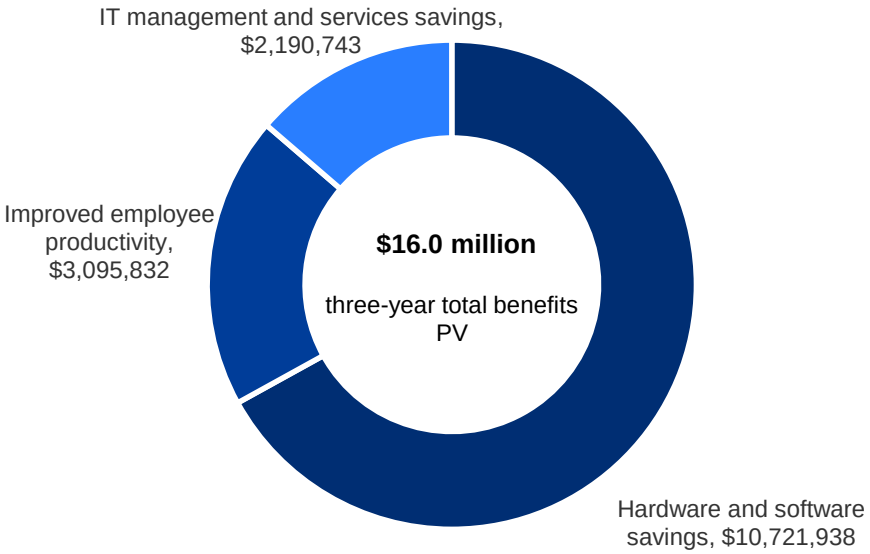
ROI
121%

Benefits PV
$16.0 million

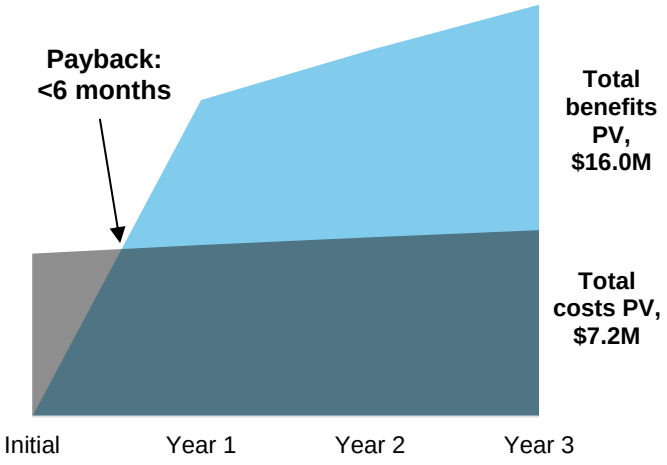
NPV
$8.8 million

Payback
< 6 months

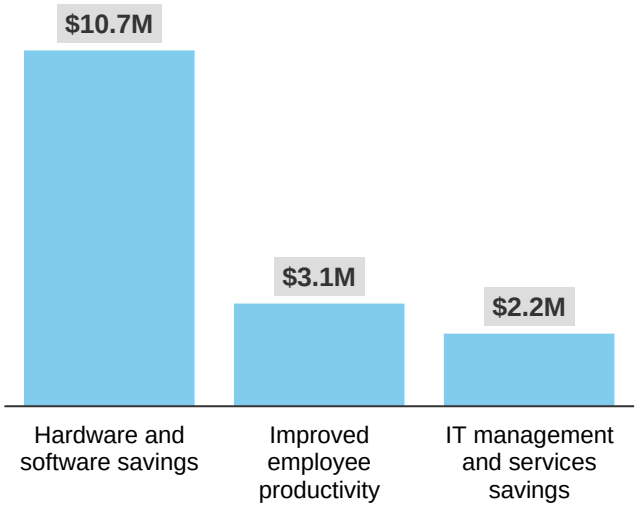
Forrester's survey of and interviews with existing customers and subsequent financial analysis found that a composite organization based on these organizations experienced benefits of $16.0 million over three years versus costs of $7.2 million, adding up to a net present value (NPV) of $8.8 million and an ROI of 121%.



Financial Summary



Benefits (Three-Year)



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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 Google Chrome devices for knowledge workers.

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 Google Chrome devices for knowledge workers 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 Chrome devices for knowledge workers.

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 Google Chrome devices for knowledge workers' 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.

The Chrome Devices For Knowledge Workers Customer Journey

BEFORE AND AFTER THE CHROME DEVICES FOR KNOWLEDGE WORKERS 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

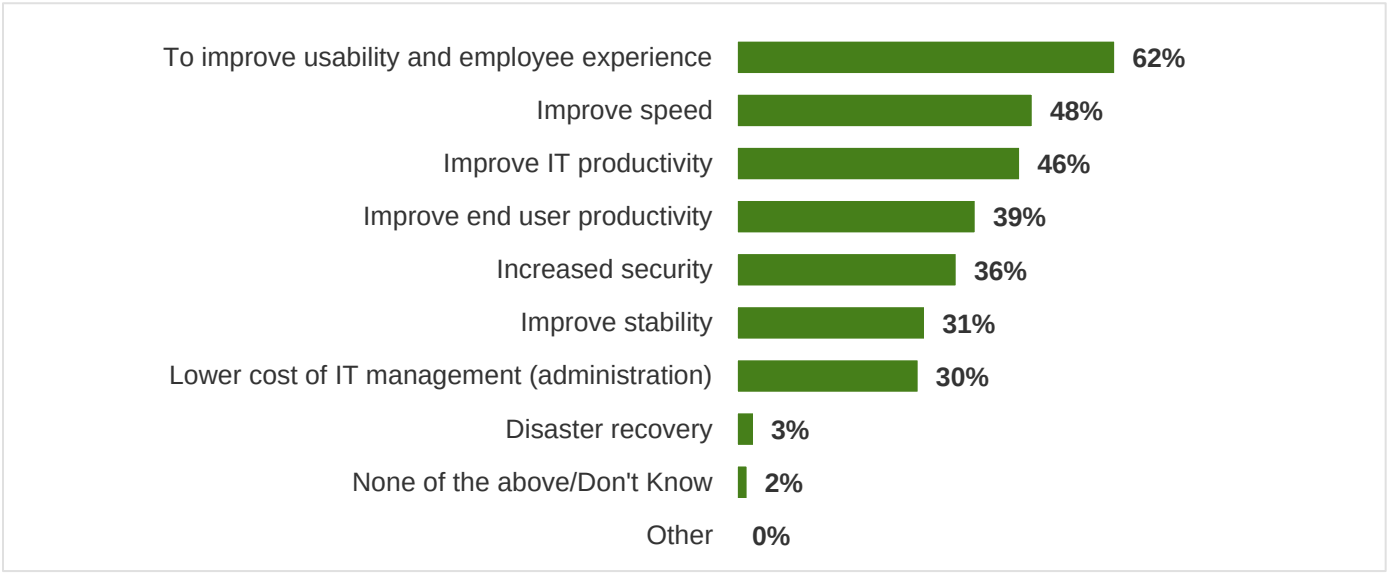
Workers value devices that foster productivity, flexibility, and convenience. Above all, employees want devices that enable continuous productivity; they can't afford to wait around for an issue to be fixed before continuing their work. Flexibility and easy, cross-device experiences are a must.[3]

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

- Usability and employee experience.
- Speed.
- IT and end user productivity.

In addition, Forrester's survey across 97 customers using Chrome devices for knowledge workers revealed the following objectives for choosing Google Chrome devices.

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



Base: 97 organizations using Google Chrome devices for knowledge workers

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

Key Results

The interviews revealed that the investment in Chrome devices for knowledge workers 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, 35% of whom (or 17,500) are considered knowledge workers, who need to be on a connected device and access company data and information to conduct day-to-day business activities. Of those 17,500 knowledge workers, 7,000 are operating on 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
- 17,500 knowledge workers
- 7,000 knowledge workers on Chrome 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 savings	$10,640,000	$665,000	$665,000	$11,970,000	$10,721,938
Btr	Improved employee productivity	$1,244,880	$1,244,880	$1,244,880	$3,734,640	$3,095,832
Ctr	IT management and services savings	$1,648,350	$438,750	$438,750	$2,525,850	$2,190,743
	Total benefits (risk-adjusted)	$13,533,230	$2,348,630	$2,348,630	$18,230,490	$16,008,513

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 7,000 Chrome devices for knowledge workers, in place of legacy devices.
- Legacy hardware costs averaged $1500 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 $10.7 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 $16.0 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	7,000	0	0
A2	Number of total devices	$A2_{prior}$+A1	7,000	7,000	7,000
A3	Legacy hardware cost per device	Input	$1,500	$1,500	$1,500
A4	Legacy software license costs per device	Input	$100	$100	$100
At	Hardware and software cost avoidance	A1*A3+A2*A4	$11,200,000	$700,000	$700,000
	Risk adjustment	↓5%			
Atr	Hardware and software cost avoidance (risk-adjusted)		$10,640,000	$665,000	$665,000

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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. Also, lower boot time and the nearly always-on nature of Chrome devices saved employees time every day.

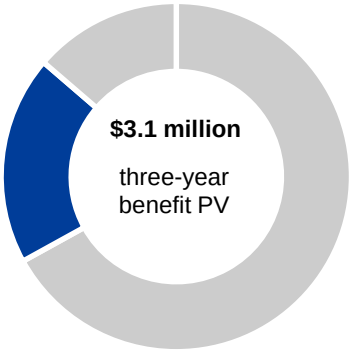
Based on the customer interviews, Forrester estimates:

- The composite organization had 7,000 Chrome devices in use for knowledge workers.
- Workers saved 30 minutes for each device each week due to reduced downtime.
- The average fully burdened salary for knowledge workers was $38/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 $3.1 million.



Improved employee productivity: **19%** of total benefits

Benefit 2: Improved Employee Productivity Calculation Table

REF.	METRIC	CALC.	YEAR 1	YEAR 2	YEAR 3
B1	Number of knowledge workers	A2	7,000	7,000	7,000
B2	Hours saved per worker per week due to reduced downtime from auto-updates and reduced device, security, and server issues	Input	0.5	0.5	0.5
B3	Average fully burdened hourly salary for knowledge workers	Input	$38	$38	$38
B4	Productivity capture	Forrester assumption	20%	20%	20%
Bt	Improved employee productivity	B1*B2*52*B3*B4	$1,383,200	$1,383,200	$1,383,200
	Risk adjustment	↓10%			
Btr	Improved employee productivity (risk-adjusted)		$1,244,880	$1,244,880	$1,244,880

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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.
- 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.

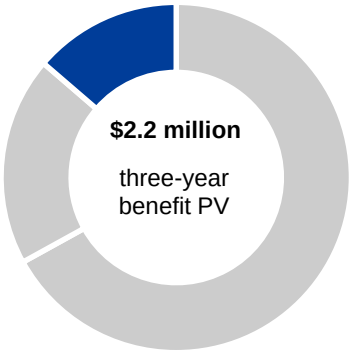
Based on the customer interviews, Forrester estimates:

- The composite organization purchased and deployed 7,000 Chrome devices for knowledge workers, in place of legacy devices.
- Legacy devices required 4 hours to image and deploy initially.
- Thirteen IT FTEs had previously managed and serviced legacy devices for knowledge workers.
- 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 $2.2 million.



IT savings:
14% of total benefits

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Benefit 3: IT Management And Services Savings: Calculation Table					
REF.	**METRIC**	**CALC.**	**YEAR 1**	**YEAR 2**	**YEAR 3**
C1	Number of new devices	A1	7,000	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*	*$1,344,000*	*$0*	*$0*
C5	Number of IT FTEs required for legacy devices		13	13	13
C6	IT administrator fully burdened annual salary		$100,000	$100,000	$100,000
C7	Improved IT productivity with Chrome devices		75%	75%	75%
C8	Productivity capture		50%	50%	50%
C9	*Subtotal: IT staff improved productivity*	*C5*C6*C7*C8*	*$487,500*	*$487,500*	*$487,500*
Ct	IT management and services savings	C4+C9	$1,831,500	$487,500	$487,500
	Risk adjustment	↓10%			
Ctr	IT management and services savings (risk-adjusted)		$1,648,350	$438,750	$438,750

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 annual enterprise upgrade costs	$5,145,000	$367,500	$367,500	$367,500	$6,247,500	$6,058,918
Etr	Implementation costs	$586,500	$0	$0	$0	$586,500	$586,500
Ftr	Change management and training costs	$599,150	$0	$0	$0	$599,150	$599,150
	Total costs (risk-adjusted)	$6,330,650	$367,500	$367,500	$367,500	$7,433,150	$7,244,568

Cost 1: Hardware And Enterprise Upgrade Costs

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

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

- Chrome devices for knowledge workers cost $700 per device.
- Chrome Enterprise Upgrades cost $50 per device annually.

This cost can vary due to uncertainty related to:

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

To account for these risks, Forrester adjusted this cost upward by 5%, yielding a three-year risk-adjusted total PV of nearly $6.1 million.

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 $7.2 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	7,000			
D2	Chrome hardware cost per device	Input	$700			
D3	Number of total devices	$D3_{prior}$+D1		7,000	7,000	7,000
D4	Chrome Enterprise Upgrade costs per device	Input		$50	$50	$50
Dt	Hardware and enterprise upgrade costs	D1*D2+D3*D4	$4,900,000	$350,000	$350,000	$350,000
	Risk adjustment	↑5%				
Dtr	Hardware and enterprise upgrade costs (risk-adjusted)		$5,145,000	$367,500	$367,500	$367,500

Cost 2: Implementation Costs

The cost to implement depends on the size of the implementation and the number of users. For the composite organization, Forrester assumes that implementation lasted six months. During this time, six full-time resources were dedicated to the deployment along with a Google-recommended third-party integrator.

For this study, Forrester assumes that:

- The monthly cost of the third-party integrator averaged $35,000.
- The fully loaded labor rate for an internal IT FTE was $100,000.

The implementation and configuration costs will vary with:

- The complexity of the deployment and the project timeline.
- The cost of resources within an organization and the third-party integrator chosen, if necessary.

To account for these risks, Forrester adjusted this cost upward by 15%, yielding a risk-adjusted total PV of $586,500.

Six months
Total implementation and deployment time

Cost 2: Implementation Costs Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
E1	Implementation time	Months	6			
E2	Internal resources required	FTEs	6			
E3	IT administrator fully burdened annual salary	C6	$100,000			
E4	Professional service fees per month	Input	$35,000			
Et	Implementation costs	E1*E4+(E1/12)*E2*E3	$510,000	$0	$0	$0
	Risk adjustment	↑15%				
Etr	Implementation costs (risk-adjusted)		$586,500	$0	$0	$0

Cost 3: Change Management And Training Costs

One of the greatest risks to fully realizing the benefits of Chrome devices for knowledge workers is lack of use and adoption. The interviewed organizations all described a cultural shift that took place as they deployed Chrome devices. This cultural change, as with any user technology, was met by three types of users:

- The champions, who are quick to adopt, innovate, and get creative about how they utilize the new technology.
- The skeptics, who aren't so sure about the new technology and are slower to adopt, but when they do, they quickly realize the benefits of the new system and become champions.
- Lastly, the laggards; these employees are set in their ways, don't want to change the way they work, and typically resist adoption and learning a new technology.

All three groups can present challenges and opportunities, so it's

important to hire a good change management team and ensure that proper training and support are provided throughout the deployment.

Forrester assumes that:

- The composite organization hired a third-party change management team at a cost of $42,500 per month for six months.
- Users received 1 hour of formal training and could schedule follow-on training as needed.

The change management and training cost will vary with:

- The culture of an organization and employees' willingness to adopt new technologies.
- The number of hours provided for formal training and the follow-on support.

To account for these risks, Forrester adjusted this cost upward by 15%, yielding a three-year risk-adjusted total PV of $599,150.

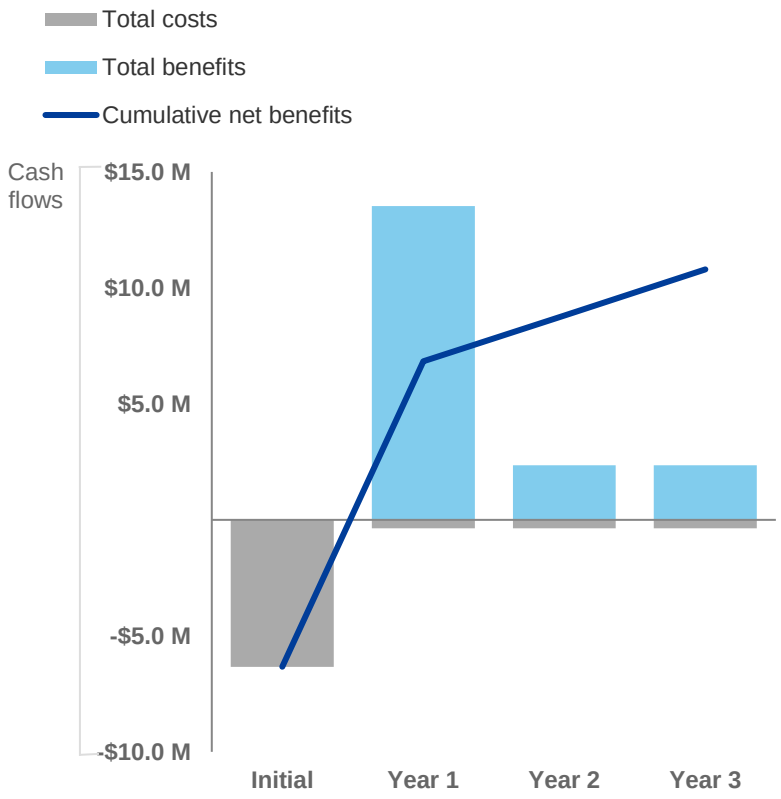
Cost 3: Change Management And Training Costs Calculation Table

REF.	METRIC	CALC.	INITIAL	YEAR 1	YEAR 2	YEAR 3
F1	Months for change management		6			
F2	Change management costs per month		$42,500			
F3	*Subtotal: change management services*	*F1*F2*	*$255,000*			
F4	Number of knowledge workers		7,000			
F5	Average fully burdened hourly salary for knowledge workers	B3	$38			
F6	Hours of training per worker		1			
F7	*Subtotal: internal training costs*	*F4*F5*F6*	*$266,000*			
Ft	Change management and training costs	F3+F7	$521,000	$0	$0	$0
	Risk adjustment	↑15%				
Ftr	Change management and training costs (risk-adjusted)		$599,150	$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	($6,330,650)	($367,500)	($367,500)	($367,500)	($7,433,150)	($7,244,568)
Total benefits	$0	$13,533,230	$2,348,630	$2,348,630	$18,230,490	$16,008,513
Net benefits	($6,330,650)	$13,165,730	$1,981,130	$1,981,130	$10,797,340	$8,763,945
ROI						121%
Payback period						< 6 months

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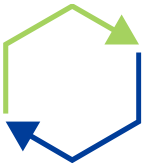
Appendix A: Total Economic Impact

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.
[2] Source: Ibid.
[3] Source: Ibid.