

The Total Economic Impact™ Of Chromebooks In Education

Cost Savings And Business Benefits Enabled By Chromebooks In Education

A FORRESTER TOTAL ECONOMIC IMPACT STUDY
COMMISSIONED BY GOOGLE, JANUARY 2024

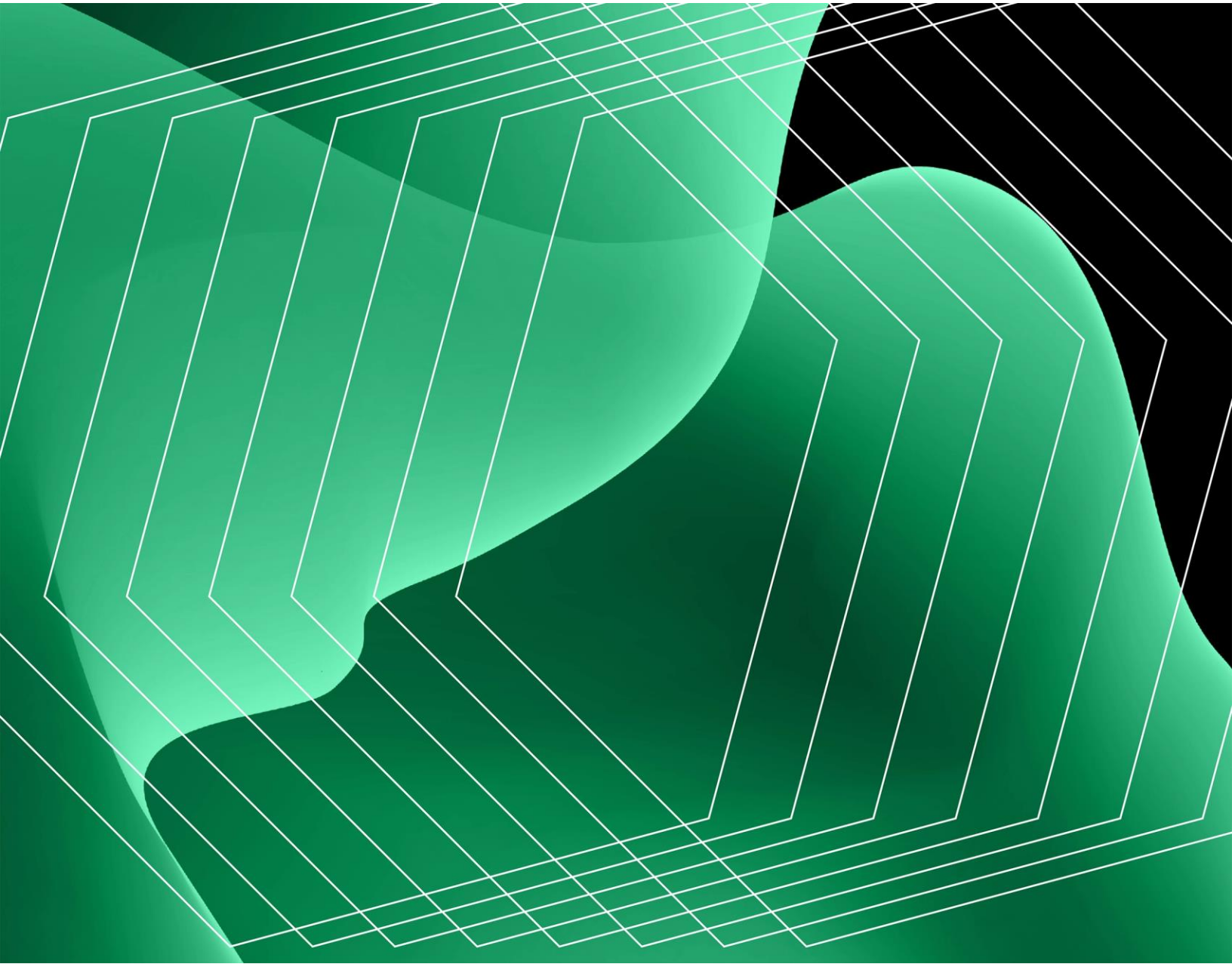


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Executive Summary

Chromebooks have become increasingly popular in educational settings. Interviewed educational leaders attributed this popularity to Chromebooks' affordability, longevity, shorter startup, and longer battery life. When used with Google Workspace for Education Fundamentals, educators received a combination of tools and features that were instrumental in transforming K-12 education. Interviewees across the world found that leveraging this platform helped improve student educational outcomes, save teachers time, lower hardware costs, reduce IT management, and enhance the security of their hardware environments.

[Chromebooks](#) provide educational organizations with a cloud-native and easy-to-deploy alternative to traditional laptops and tablets. Additionally, qualifying educational institutions receive free access to [Google Workspace for Education Fundamentals](#) for their students and teachers, which provides a comprehensive collaboration suite and a robust academic management system. The two solutions complement each other as a cloud-based platform that allows for broader technological access for students, teachers, and staff across school systems.

Google commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) organizations may realize by deploying Chromebooks in education.¹ The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Chromebooks in education.

To better understand the benefits, costs, and risks associated with this investment, Forrester interviewed 18 representatives at nine organizations with experience using Chromebooks in education. For the purposes of this study, Forrester aggregated the interviewees' experiences and combined the results into a single [composite organization](#) that is an educational group with 30,000 elementary students and 1,200 teachers across several individual schools.

KEY STATISTICS



Return on investment (ROI)

229%

Net present value

\$24.45M

Payback

<6 months

Benefits PV

\$35.12M

Interviewees said that prior to using Chromebooks, teachers struggled to adapt technology in the classrooms, IT groups were burdened with significant costs to deploy and manage devices, students had class time reduced while waiting for devices to startup each day, and socioeconomically disadvantaged students missed the educational benefits of having their own dedicated device. Prior attempts to add dedicated devices to the classroom yielded limited success, leaving interviewees' organizations with frustrated teachers, lower student time on task, and wasted IT resources.

After the investment in Chromebooks, the interviewees described improved educational outcomes, organizational security, and cost savings. Key results from the investment include saved student and teacher time, significantly reduced IT burden, more secure environments, and less need for third-party accessibility tools and services.

“Dare to take the leap to Google. In the end, it provides schools with a very pleasant environment that has benefits on all sides for students, staff, management, and your budget.”

IT MANAGER, K-12, EMEA

KEY FINDINGS

Quantified benefits. Five-year, risk-adjusted present value (PV) quantified benefits for the composite organization include:

- **Avoided legacy hardware and peripheral costs.** The lower cost of Chromebooks enables the composite school system to reduce its hardware budget significantly and ensure that each student receives a device. Additionally, students no longer need keyboards or additional accessories required by legacy tablets. Teachers are also able to have high-powered Chromebooks that cost less than comparable legacy devices. Over five years and a cumulative total of 30,000 students and 1,200 teachers, the composite organization saves \$28.0 million in avoided cost of legacy hardware.

“Chromebooks are quite a bit less expensive. We usually get student devices for between \$200 and \$250, but it's almost double for [our legacy devices].”

DISTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

- **Reduced device environment management.** IT staff reduce the amount of time they spend deploying and managing Chromebooks by 76% by using Google Workspace for Education Fundamentals and cloud-based storage and applications. Over five years, the composite organization saves \$3.8 million in saved labor managing 30,000 student Chromebooks and 1,200 teacher Chromebooks.
- **Reduced need for third-party accessibility tools and services.** One-third fewer students require third-party accessibility tools and services as

they can now use the tools included with Chromebook and Google Workspace for Education Fundamentals. These tools in the Google solutions include translation, screen magnification, text to speech, and voice dictation. The reduced need for third-party accessibility tools and services saves the composite organization \$478,000 over a five-year period.

- **Enhanced security of Chromebook and Google Workspace for Education Fundamentals.** The composite organization avoids successful ransomware attacks by having Chromebooks. This is largely because Chromebooks have built-in security features from ChromeOS that are typically not found in legacy OS devices. The avoided costs save the composite school a total of \$2.8 million over five years.

Quantified educational outcomes. The composite school also benefits from improved educational outcomes that are quantified in terms of students' and teachers' time on task.

- **Improved student time-on-task.** Students benefit from Chromebooks' faster startup time each day. The devices also do not require lengthy updates that interrupt learning time. Students save additional time with improved collaboration through Google Workspace for Education Fundamentals. The time on task per student improves by 18 hours each school year, which is reallocated towards additional learning.
- **Improved teacher time-on-task.** Teachers also save time from the faster startup time and updates with Chromebooks and have fewer disruptions during class. In addition, they can use Google Workspace for Education Fundamentals to communicate with parents and guardians more effectively and more efficiently prepare for lessons. The teachers save 42 hours in labor per teacher each school year.

Unquantified benefits. Benefits that provide value for the composite organization but are not quantified for this study include:

- **Grows student enrollment.** As the composite organization improves the educational outcomes of its students, it becomes a school of choice for parents and begins attracting additional families into its area. The gradual

increase in students comes with an increase in funding and resources, which in turn further improves educational outcomes.

- **Reduces student performance gaps that are due to socioeconomic disadvantages.** Students can improve their access to technology at home as they are able to take Chromebooks home with them each day and during the summer. This is enabled in part by the lower cost of Chromebooks since there is less financial risk for the composite school if a Chromebook is lost or needs to be replaced. This is also enabled by the administrative policies available in Google's Admin console. This helps reduce the gap in student performance that is attributable to the socioeconomic disadvantages some students face.
- **Benefits from seamless integration between Chromebooks and Google Workspace for Education Fundamentals.** Teachers and students benefit as Google Workspace for Education Fundamentals runs especially well on Chromebooks because its ChromeOS is built around cloud-based applications. Teachers and students also benefit as ChromeOS provides access to additional educational learning tools that can augment the educational experience provided by Google Workspace for Education Fundamentals.
- **Helps engage parents and guardians into the learning process, further improving educational outcomes.** Teachers use Google Workspace for Education Fundamentals on Chromebooks to communicate and coordinate with parents. In turn, parents are given more visibility into their children's progress and educational results and can then better support their children with daily insights into their specific needs. This is instead of waiting for feedback from major tests or grading periods, and the more constant and automated loop of feedback between parents and teachers results in better educational results for students, better relationships with parents, and saved time for teachers.
- **Allows children with different abilities to be better included.** More students with differing abilities can use standard Chromebooks. In the past, they previously required special legacy devices or services than their peers

used. Having a greater proportion of students using the same types of devices aids the social cohesion between children.

- **Enables children to self-select the tools that make them most effective.** More students can self-select which accessibility features are more useful, which provides them with greater autonomy and ability to grow new skills. This is not just true for students who traditionally need special legacy devices or services but is also for students who may have different learning needs and may, for example, benefit from words being read aloud to them as they follow along or may prefer higher contrast colors on their screen.
- **Improves faculty collaboration.** Faculty members use Google Workspace for Education Fundamentals to better collaborate with each other on projects and assignments. This is especially useful for staff who may have difficulty adapting to new technologies and would benefit from the ease of collaboration with applications built into Google Workspace for Education Fundamentals.
- **Reduces repair costs.** IT staff spend less time and money repairing Chromebooks than legacy devices. This is due in part to Chromebook's modular design and the ease of replacing single parts.
- **Additional savings from cloud operations.** School administrators save additional budget by using Google Workspace for Education Fundamentals to replace their existing on-premises legacy services.

Costs. Five-year, risk-adjusted PV costs for the composite organization include:

- **Chromebook costs.** The composite school replaces its legacy devices for students and teachers with Chromebooks over a three-year period. As Chromebooks last longer, the composite school replaces them after five years instead of three, making replacement costs much lower in Year 4 and Year 5. The total costs of Chromebook for students and Chromebook Plus for teachers over a five-year period is \$9.7 million.
- **Labor for improved student and teacher outcomes.** A total of 12 IT staff and teachers assist with the initial training for students and teachers to effectively use the many tools and features that come with Chromebook

and Google Workspace for Education Fundamentals. This training requires the 12 employees to spend all their time for four months across the school system. After this, six employees continue training for a portion of their time during the school year. Over five years, this costs the composite school \$951,000.

The representative interviews and financial analysis found that a composite organization experiences benefits of \$35.12 million over three years versus costs of \$10.66 million, adding up to a net present value (NPV) of \$24.45 million and an ROI of 229%.

EXECUTIVE SUMMARY



ROI

229%



IT TIME SAVINGS

76%



ANNUAL TEACHER
TIME SAVINGS

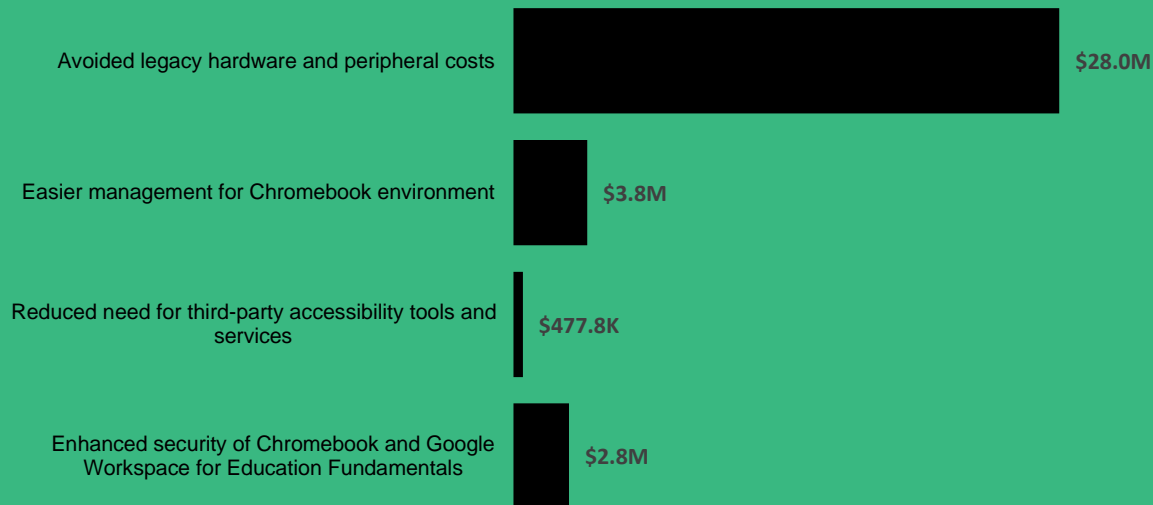
42 HOURS



ANNUAL STUDENT
TIME SAVINGS

18 HOURS

Benefits (Five-Year)



“There isn’t one way that Chromebooks cost more than [our legacy devices]. It’s a total savings.”

DISTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

TEI Framework And Methodology

From the information provided in the interviews, Forrester constructed a Total Economic Impact™ framework for those organizations considering an investment Chromebooks in education.

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 Chromebooks in education can have on an organization.

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 study to determine the appropriateness of an investment in Chromebooks in education.

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.

1. Due Dilligence

Interviewed Google stakeholders and Forrester analysts to gather data relative to Chromebooks in education.

2. Interviews

Interviewed 18 representatives at nine organizations using Chromebooks in education to obtain data about costs, benefits, and risks.

3. Composite Organization

Designed a composite organization based on characteristics of the interviewees' organizations.

4. 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 interviewees.

5. Case Study

Employed four fundamental elements of TEI in modeling the investment impact: benefits, costs, flexibility, and risks. Given the increasing sophistication of ROI analyses related to IT investments, Forrester's TEI methodology provides a complete picture of the total economic impact of purchase decisions. Please see [Appendix A](#) for additional information on the TEI methodology.

The Chromebooks In Education Customer Journey

Drivers leading to the Chromebooks in education investment

| Interviews | | | |
|--|----------|---------------|--------------------|
| Role | Industry | Region | Number of students |
| <ul style="list-style-type: none"> Board of education director | K-12 | APAC | 14,000 |
| <ul style="list-style-type: none"> Board of education chief manager | | | |
| <ul style="list-style-type: none"> Board of education director | K-12 | APAC | 2,000 |
| <ul style="list-style-type: none"> Vice director | K-12 | APAC | <1,000 |
| <ul style="list-style-type: none"> Director of strategic partnerships | K-12 | EMEA | 4,500 |
| <ul style="list-style-type: none"> Director of digital teaching and learning | | | |
| <ul style="list-style-type: none"> IT administrator | K-12 | EMEA | 1,800 |
| <ul style="list-style-type: none"> IT manager | | | |
| <ul style="list-style-type: none"> IT superintendent | | | |
| <ul style="list-style-type: none"> Educational technology officer | K-12 | Latin America | 400,000 |
| <ul style="list-style-type: none"> Leader of technology policy in schools | | | |
| <ul style="list-style-type: none"> Secretary of education | K-12 | Latin America | >1,000,000 |
| <ul style="list-style-type: none"> Operational director | | | |
| <ul style="list-style-type: none"> Director of new projects | | | |
| <ul style="list-style-type: none"> District edtech coordinator | K-12 | North America | 13,000 |
| <ul style="list-style-type: none"> Edtech project manager | | | |
| <ul style="list-style-type: none"> Director of information and instructional technology | K-12 | North America | 19,000 |
| <ul style="list-style-type: none"> Technology integration specialist | | | |

Key Challenges

Prior to investing in Chromebooks and adopting Google Workspace for Education Fundamentals, school systems struggled with high device costs, overburdened IT groups, and inefficient use of class time.

The interviewees noted how their organizations struggled with common challenges, including:

- **Hardware issues limiting teacher effectiveness and student outcomes.** Students were not the only ones who struggled to work effectively with legacy educational devices. In many cases, teachers found that the short battery life of their legacy devices tethered them to their desks and didn't allow them to move about the classroom. Additionally, the longer startup time and lengthy updates for legacy devices meant they lost significant time each day waiting for each child to have their laptops or tablets powered on and ready for use.

“The biggest issue with [legacy devices] is battery life. The batteries go bad quickly and a teacher cannot make it through the day without needing to plug their device in. The longevity of the hardware, ease of user interface, and ease of management of the devices, along with cost, are big reasons why we transitioned our staff members from [legacy] to Chrome.”

EDTECH PROJECT MANAGER, K-12, EMEA

The board of education director of an APAC K-12 school system said, “Since both instructors and learners are unfamiliar with an environment where each individual has their own device, it is important for the device to be trouble free and cloud based to minimize the loss of learning time due to hardware issues.”

- **Missed educational benefits from students not having their own dedicated device.** Many schools were not able to offer students a dedicated device due to the high cost of legacy laptops and tablets. Parents and school leaders were concerned that their students would not be as prepared for an increasingly digital world and that teachers would not be able to take advantage of powerful online resources.

The IT superintendent of a Latin American K-12 school systems said: “With the return of [in-person] classes, we saw the need to renew our technology and recover our learning process. We only had one computer for every 15 students, and we needed a higher availability of equipment. We made the investment in Chromebooks so students could have access to all the learning resources.”

The director of information and instructional technology of a North American K-12 school district said, “We couldn’t afford to get our students devices [at a cost of] \$1,200 per kid. Then Chromebooks came out, and it was the first time we could get a low-cost and really usable device for nearly every single kid. It worked [in terms of] cost, logistics, and even culture since the kids all had Google accounts.”

- **Growing technological disparity between socioeconomically disadvantaged students.** Many school systems had student bodies with a wide mix of backgrounds, with some families having greater financial resources than others. Educational leaders found that students whose families could afford computers at home had advantages over students who could only use computers at school. Leaders sought to provide an environment where students could not only have their own dedicated device but could take it home each day. The high cost of legacy laptops and tablets prevented this.

The board of education director of an APAC K-12 school system said, “It is important for the running costs and associated costs to be set as low as possible in consideration of the burden on families.”

“One of the biggest gaps for our students is not all families have access to computers. Chromebooks give us the ability to provide computer access for students at home. It bridges that gap, so everybody has equal access. That's a huge thing in our district.”

DISCTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

- **Difficulty addressing accessibility needs while maintaining a unified technological platform.** Students also had diverse accessibility needs. This required educational leaders to provide them with special devices since many legacy devices lacked built-in accessibility tools. Not only did this cost the school district more, but students who used these devices often felt they did not belong with the other students who matched each other. Additionally, teachers had to learn how to use multiple types of devices in their classrooms, which took time away from their classroom preparation.

The director of digital teaching and learning of an EMEA K-12 school trust said: “Children's barriers are often around writing and being able to articulate their thinking in a different way. ChromeOS's [speech-to-text tool] has been key for those children who might not necessarily be able to put pen to paper but can verbally explain their thoughts. So that's massively helped in our schools.”

The director of digital teaching and learning of an EMEA K-12 school trust also said: “Chromebook allows children to freely access tools that help

them. Allowing children to be self-selective has been a huge part of our project.”

- **Excessive ongoing IT labor for device deployment and management.** Educational IT groups were often tasked with supporting new technological programs without additional resources or funding. As schools began adding new legacy devices, IT staff struggled to scale environments because many devices required individual-level management and specialized software or equipment. This took staff away from other high-priority work and slowed down rollout by months.

The director of information and instructional technology of a North American K-12 school district said: “From a business case perspective, school districts never have enough IT staff and support. We just don’t. And then we must add new technology without increasing staff? The cost and ability to manage Chromebooks easily is foundational.”

The IT superintendent of a Latin American K-12 school systems said: “Before [Chrome Education Upgrade], we used [another platform] to share computers. But we got feedback from the network team that said they had difficulties with the tool and they had a hard time getting it to work.”

“[Legacy devices] are a nightmare to manage. We probably spent more time managing 100 [legacy devices] than we do 4,000 Chromebooks.”

DIRECTOR OF STRATEGIC PARTNERSHIPS, K-12, EMEA

Solution Requirements/Investment Objectives

The interviewees' organizations searched for a solution that could:

- Allow for a 1:1 ratio between students and devices.

The IT superintendent of a Latin American K-12 school systems said: “We first considered a traditional notebook for our students, but we decided to instead invest in Chromebooks because they are devices aimed at education. Also, [Chromebooks] cost less, which allowed us to purchase a greater number and make more available to the schools.”

- Significantly reduce disruption in the classroom from long startup times and limited battery life.

The district edtech coordinator of a North America K-12 school district said: “The reason we went Chromebooks really was because the battery life is better and it only takes 8 seconds to load to start up a Chromebook when compared to [legacy devices]. That and then they're just easy to manage.”

The same interviewee also said: “For us to consider moving back to [a legacy OS], at minimum you'd have to find us a device under \$400 that can boot up and get to the internet in less than 8 seconds like a Chromebook can. We only have 55 minutes each period, so it's dead in the water if it needs to stop and update.”

- Be interchangeable to avoid delays and issues when students needed to change devices.

The director of digital teaching and learning of an EMEA K-12 school trust said: “Chromebooks are interchangeable. If a student breaks one, they just go to the library, turn on the new Chromebook, and get back to work. It's a whole ecosystem where work is device agnostic. [Legacy] devices are specialized and can't compete with a system like that.”

- Provide the greatest overall value for systemwide adoption.

The board of education director of an APAC K-12 school said: “I scored each operating system on an item-by-item basis and stated my findings for the school board. I also shared that there is a problem of lengthy startups

with [legacy devices]. After this, the school board voted to adopt Chromebook.”

Composite Organization

Based on the interviews, Forrester constructed a TEI framework, a composite company, and an ROI analysis that illustrates the areas financially affected. The composite organization is representative of the 18 interviewees and their nine organizations, and it is used to present the aggregate financial analysis in the next section. The composite organization has the following characteristics:

Description of composite. The educational organization serves 30,000 K-12 students across multiple schools and employs 1,200 teachers along with 60 IT staff responsible for student and teacher endpoint devices. Every student and teacher is given their own legacy device. Student devices are replaced once every three years on average. Teacher devices last longer and are replaced at an average interval of once every four years.

Deployment characteristics. The composite educational organization begins replacing legacy devices with Chromebooks in Year 1, with a third of all student and teacher devices replaced each year until all students and teachers have Chromebooks in Year 3.

KEY ASSUMPTIONS

30,000 students

1,200 teachers

Three-year migration to Chromebooks

60 IT FTEs supporting student and teacher devices

\$288,000 annual expected cost of ransomware attacks on student and teacher devices

Analysis Of Benefits

Quantified benefit data as applied to the composite

Total Benefits

| Ref. | Benefit | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total | Present Value |
|------|---|-------------|-------------|-------------|-------------|-------------|--------------|---------------|
| Atr | Avoided legacy hardware and peripheral costs | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$36,950,000 | \$28,013,914 |
| Btr | Easier management for Chromebook environment | \$428,868 | \$870,732 | \$1,299,600 | \$1,299,600 | \$1,299,600 | \$5,198,400 | \$3,780,496 |
| Ctr | Reduced need for third-party accessibility tools and services | \$21,038 | \$84,150 | \$189,338 | \$189,338 | \$189,338 | \$673,200 | \$477,806 |
| Dtr | Enhanced security of Chromebook and Google Workspace for Education Fundamentals | \$322,575 | \$654,925 | \$977,500 | \$977,500 | \$977,500 | \$3,910,000 | \$2,843,517 |
| | Total benefits (risk-adjusted) | \$8,162,481 | \$8,999,807 | \$9,856,438 | \$9,856,438 | \$9,856,438 | \$46,731,600 | \$35,115,733 |

Avoided Legacy Hardware And Peripheral Costs

Evidence and data. All interviewees found that Chromebooks cost their organizations less per device than the legacy devices they had either used in the past or had compared in their own business case. While the exact device price point varied by educational group, Chromebooks were found to be at most half as expensive as a comparable legacy device for students and teachers alike.

- In addition to being purchased at a lower cost, educational decision-makers found that Chromebooks lasted longer than the legacy devices they had previously used. Interviewees attributed this in part to the cloud-based nature of Chromebooks and that hardware requirements did not change significantly over time.

The director of strategic partnerships at an EMEA school trust said: “If we bought a [legacy tablet] and a Chromebook on the same day, I reckon that

the Chromebook would get at least five times as much use. You can use a Chromebook all day, every day and they're still going strong. On the other hand, for some of those [legacy tablets], you get a new update after two and a half years and they go to a halt.”

- Interviewees noted that when comparing devices at a similar price point, Chromebooks significantly outperformed alternative choices in terms of performance and functionality. For instance, the district edtech coordinator of a North American school district mentioned that a \$400 legacy device would not perform up to required standards and would likely inhibit student performance, but a \$400 Chromebook would easily meet these standards. For this reason, internal business cases for Chromebooks never considered price between Chromebooks and legacy devices to be the same.

The district edtech coordinator of a North American K-12 school district said: “You can get a [legacy] device for almost the same price as a Chromebook, but it's like comparing a base model to a souped-up model. Why not get the souped-up Chromebook with a touchscreen for the same price as the stripped-down [legacy] machine?”

- In addition, Chromebooks did not need the additional keyboards or other accessories that legacy tablets often required, further reducing their relative cost.

The technology integration specialist of a North American K-12 school district said, “We tried [legacy tablets] as an experiment, but they had a huge flaw, especially with the older students. They needed a keyboard to write their papers and essays. So, it's not just the price point with Chromebooks that's lower, but that fact that it has a usable keyboard.”

Device cost savings per Chromebook

50%

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- This benefit quantifies the avoided purchase of legacy devices for 30,000 students and 1,200 teachers.
- In the previous environment, students need legacy devices replaced every three years while teachers need devices replaced every four years.
- Additional legacy devices are purchased for students for spares and new student transfers. The number of additional legacy devices purchased each year is equal to five percent of the total student population.
- Student legacy devices cost \$600 each and legacy devices for teachers cost \$1,250 each.
- The average student requires an additional \$10 in peripherals for the legacy devices. This amount accounts for additional keyboards and trackpads for students using legacy tablets.

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- The cost of legacy devices, and their replacement rate, will vary by region, grade, and school budget.
- The number of students who require peripheral devices, such as keyboard and trackpads, will similarly vary across schools.

Results. To account for these risks, Forrester adjusted this benefit downward by 0%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$28 million.

“There really is no performance issue with our five- to six-year-old Chromebooks. They just work. But on the flipside, we can't use [legacy] devices after 4-5 years. They don't have enough RAM anymore, and new programs won't work as well.”

DIRECTOR OF INFORMATION AND INSTRUCTIONAL TECHNOLOGY, K-12, NORTH AMERICA

Avoided Legacy Hardware And Peripheral Costs

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|--------------------------------------|--|---|--|--------------------|--------------------|--------------------|--------------------|
| A1 | Enrolled students | Composite | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| A2 | Replacement rate of legacy student devices in years | Composite | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| A3 | Additional legacy student devices for spares and student transfers | $A1 \times 5\%$ | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| A4 | Legacy student devices avoided replacing | $(A1/A2) + A3$ | 11,500 | 11,500 | 11,500 | 11,500 | 11,500 |
| A5 | Cost per legacy student device | Interviews | \$600 | \$600 | \$600 | \$600 | \$600 |
| A6 | Average cost of accessories for legacy student device | Interviews | \$10 | \$10 | \$10 | \$10 | \$10 |
| A7 | Subtotal: Legacy student device hardware | $A4 \times (A5 + A6)$ | \$7,015,000 | \$7,015,000 | \$7,015,000 | \$7,015,000 | \$7,015,000 |
| A8 | Number of teachers | Composite | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| A9 | Replacement rate of teacher legacy devices in years | Interviews | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| A10 | Cost of legacy teacher device | Interviews | \$1,250 | \$1,250 | \$1,250 | \$1,250 | \$1,250 |
| A11 | Subtotal: Legacy teacher hardware | $A8/A9 \times A10$ | \$375,000 | \$375,000 | \$375,000 | \$375,000 | \$375,000 |
| At | Avoided legacy hardware and peripheral costs | $A7 + A11$ | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 |
| | Risk adjustment | 0% | | | | | |
| Atr | Avoided legacy hardware and peripheral costs (risk-adjusted) | | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 | \$7,390,000 |
| Five-year total: \$36,950,000 | | | Five-year present value: \$28,013,914 | | | | |

Easier Management For Chromebook Environment

Evidence and data. Chromebooks were significantly easier for IT groups to deploy and manage because much of the labor was automated and performed at scale through Google's ChromeOS device management service. The saved labor, software, and hardware resources could instead be focused on improving the school's environment and completing new initiatives instead of basic management and maintenance of endpoint devices.

- A school district in North America was able to support over 12,000 students and Chromebooks with just five IT FTEs spending a portion of their time on device management. Interviewees from the school district estimated that if each student had a legacy laptop instead, the IT group would need to double or triple in size to manage those devices.
- A school system in APAC was able to reduce the amount of time on device management from 420 hours per year for legacy devices to under 5 hours for Chromebooks, which is equivalent to nearly a 99% reduction. Much of this improvement was attributed to Chromebooks not requiring regular updates for local systems and infrastructure.
- Some schools found that Chromebook management through Chrome Education Upgrade device management was so simple that IT no longer needed to be involved with them on a day-to-day basis and the work could be absorbed by other departments. This freed IT groups up for more technical and higher-value work.

The district edtech coordinator of a North American K-12 school district said: "Our IT department does not touch a single Chromebook in our district. We're at 15,000 devices and our IT department does nothing with Chrome. It's all managed by our student program. It's a super easy program to manage." The same interviewee also said: "I can't even imagine how many more people you would need to manage in a [legacy] environment because they're high maintenance. ... Management is 100 times easier in Chrome[OS] than [legacy], for sure."

The director of information and instructional technology of a North American K-12 school district said: "When we got Chromebooks, we could

literally roll out 5,000 of them in a week. And 90% of that week was just the logistics of how you get these in the hands of kids. On the other hand, it took us two to three months over a fall quarter when we tried to roll out 1,200 [legacy devices].”

A school district in North America received 50% fewer support tickets after moving to Chromebooks compared to when each student had a legacy device.

- Additionally, some IT groups found that they were required to buy additional software and even hardware to manage legacy devices. IT groups already had low budgets and struggled with this additional burden. By moving to Chromebooks, these IT groups no longer needed to buy extra software or hardware and could reallocate that budget elsewhere.

The director of information and instructional technology of a North American K-12 school district said: “Another issue with [legacy tablets] is that we couldn't scale them. We tried to use [legacy management software], but now you had to buy an additional expensive device to use it.”

- IT groups appreciated that they could support thousands of Chromebooks without requiring additional headcount. This was especially important as many leaders had already been told that they would not be given more funding for additional IT staff.

The director of information and instructional technology of a North American K-12 school district said: “Commercial companies can look at their bottom line and say I need to hire more IT staff. Education is not like that; we need to develop these programs with the people and budget we have. You know what Google's done? They give us an inexpensive device that just works all the time and has a way to manage 20,000 to 30,000 of them.”

The director of strategic partnerships for an EMEA K-12 school trust said: “We've also saved in terms of staffing. When IT technicians are on the ground, they're very rarely working on the Chromebooks because they can all be managed for remotely.”

- IT groups also saved time registering new students into their school system, which especially helped at the beginning of each new school year.

The director of information and instructional technology of a North American K-12 school district said: “Everything is integrated into Google Classroom. This gives us the ability to get students all set up within 24 hours of registering into our district. They have a Google account, they're in Google Classroom, they're registered in classes and have everything they need. This is all completely automated. It is very difficult, if not impossible, to automate in a [legacy] ecosystem.”

IT time saved supporting Chromebooks

76%

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- The composite school employs 25 IT staff whose primary responsibility is to deploy and manage legacy devices for its 30,000 students and 1,200 teachers.
- IT staff are paid a fully burdened annual salary of \$72,000.
- IT staff save 76% of their time deploying and managing student and teacher devices as Chromebooks require significantly less manual effort.
- IT staff gradually save more time as more students and teachers move to Chromebooks over a three-year period.
- These time savings allow the equivalent of six IT staff to manage all student and teacher Chromebooks, as opposed to the 25 IT staff who were required to manage legacy student and teacher devices. The equivalent of 19 IT staff are then free to work on higher-value projects for the composite school.

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- While interviewees consistently reported significant time savings deploying and managing Chromebooks, the amount of time varied depending on whether all students and teachers transitioned away from legacy devices. Schools who maintained some legacy devices generally realized less IT efficiency than those who transitioned fully to Chromebooks.
- The value of saving time for IT staff will depend on the types of activities and projects their time can be reallocated towards.

Results. To account for these risks, Forrester adjusted this benefit downward by 5%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$3.8 million.

“When a [legacy] device goes down, we have to try to recover and then reimagine. But for Chromebook, any teacher can do a hard reset in two seconds. It's super simple and it's minutes instead of an hour.”

DISTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

| Easier Management For Chromebook Environment | | | | | | | |
|---|---|---|---|-----------|-------------|-------------|-------------|
| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| B1 | Number of IT staff with primary responsibility for legacy student and teacher devices | Composite | 25 | 25 | 25 | 25 | 25 |
| B2 | IT time saved supporting Chromebooks | Interviews | 76% | 76% | 76% | 76% | 76% |
| B3 | Number of IT staff with primary responsibility for student and teacher Chromebooks | B1*(1-B2) | 6 | 6 | 6 | 6 | 6 |
| B4 | Percent of students using Chromebooks (rounded) | 1/A2, aggregating previous years until 100% | 33% | 67% | 100% | 100% | 100% |
| B5 | IT support staff fully burdened salary | TEI standard | \$72,000 | \$72,000 | \$72,000 | \$72,000 | \$72,000 |
| Bt | Easier management for Chromebook environment | B1*B2*B4*B5 | \$451,440 | \$916,560 | \$1,368,000 | \$1,368,000 | \$1,368,000 |
| | Risk adjustment | ↓5% | | | | | |
| Btr | Easier management for Chromebook environment (risk-adjusted) | | \$428,868 | \$870,732 | \$1,299,600 | \$1,299,600 | \$1,299,600 |
| Five-year total: \$5,198,400 | | | Five-year present value: \$3,780,496 | | | | |

Reduced Need For Third-Party Accessibility Tools And Services

Evidence and data. In addition to saving money on the initial purchase of devices, school systems were able to reduce spend on third-party services and accessibility tools by deploying Chromebooks.

- Interviewees found that they saved a third or more of their previous cost of third-party services and accessibility tools due to the tools and services already included with Chromebooks and Google Workspace for Education Fundamentals.
- Some schools were able to reallocate some of their translation services and students could use text-to-speech translation on their Chromebook to

communicate with teachers. This allowed schools to prioritize translators for higher-priority cases and reduce costs elsewhere.

Reduction in students requiring additional accessibility tools

33%

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- Prior to adopting Chromebooks, 15% of students require third-party tools and services to assist with their accessibility needs.
- A third of these students fully replace these additional third-party tools with built-in accessibility tools on their Chromebooks. The organization reaps this full benefit in Year 3, when all students are in the Chromebook ecosystem.
- The average cost of third-party accessibility tools and services per student who requires them is \$150.

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- The number of students who no longer required third-party accessibility tools and services varied widely depending on the student population and what tools they had previously used.
- Similarly, interviewees shared a wide range of costs for third-party tools and services that could be replaced with Chromebooks and Google Workspace for Education Fundamentals.

Results. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$478,000.

“We have a large second-language population, and those students would use the features right away to communicate with teachers when we started giving them Chromebooks. Then we started using [Workspace for Education Fundamentals], and it would auto translate for the parents as well. It's just really made it easier for our students, parents, and teachers to communicate.”

DISTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

Reduced Need For Third-Party Accessibility Tools And Services

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-----------------------------------|--|-------------|---|----------|-----------|-----------|-----------|
| C1 | Number of students using Chromebooks | A1*B3 | 10,000 | 20,000 | 30,000 | 30,000 | 30,000 |
| C2 | Percentage of students who require third-party accessibility tools and services | Composite | 15% | 15% | 15% | 15% | 15% |
| C3 | Cost of accessibility tools and services per student | Interviews | \$150 | \$150 | \$150 | \$150 | \$150 |
| C4 | Reduction in students who require additional accessibility tools and services due to built-in accessibility tools in Chromebooks | Interviews | 11% | 22% | 33% | 33% | 33% |
| Ct | Reduced need for third-party accessibility tools and services | C1*C2*C3*C4 | \$24,750 | \$99,000 | \$222,750 | \$222,750 | \$222,750 |
| | Risk adjustment | ↓15% | | | | | |
| Ctr | Reduced need for third-party accessibility tools and services (risk-adjusted) | | \$21,038 | \$84,150 | \$189,338 | \$189,338 | \$189,338 |
| Five-year total: \$673,200 | | | Five-year present value: \$477,806 | | | | |

Enhanced Security Of Chromebook And Google Workspace For Education Fundamentals

Evidence and data. Interviewed IT leadership found that the number of security incidents and breaches their district experienced fell after migration to Chromebooks. This was attributed to Chromebook’s cloud-based OS and built-in security features from Google.

- When asked, no interviewee reported successful ransomware attacks on Chromebooks in their school system. This was largely attributed to built-in security tools from ChromeOS, such as sandboxing, verified boot, automatic updates, and limited access to local files.

The board of education director of an APAC K-12 school system said: “Chromebook has the features necessary to achieve our objectives. It is particularly superior to other operating systems in terms of security measures.”

The edtech project manager of a North American school district said, “Chromebooks eliminate the scare of viruses and potentially downloading harmful software.”

- Education IT leaders found that the number of security breaches dropped as they expanded Chromebook usage in their school districts, and they expected this trend to continue.

The executive director of technology of a North American K-12 school district said: “The number of security breach incidents on staff devices has decreased at the same rate as our Chromebook distribution. That also means users no longer need to worry about their data being backed up and secure.”

- The secretary of education of a Latin American state said, “Security is very important, and Chromebooks allow us to lock information so it can’t be accessed if the device is stolen.”

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- The composite school previously spent an average of \$1.15 million a year on ransomware attacks on student and teacher devices. This figure accounts for the response, audit, fines, forensics, and recovery for each incident.
- Ransomware costs are reduced proportionally to the number of students and teachers who transition from legacy devices to Chromebooks over a three-year period.

Reduction in successful ransomware attacks on student and teacher devices

100%

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- While no interviewees reported a successful ransomware attack on their Chromebooks, no device, OS, or software is completely immune from malicious attacks or malware.
- The cost of ransomware attacks or other security breaches will vary across school types.

Results. To account for these risks, Forrester adjusted this benefit downward by 15%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$2.8 million.

“We haven't had a virus, ransomware, or malware attack since we've moved to Chromebook, so that's really a big plus for us.”

IT MANAGER, K-12, EMEA

Enhanced Security Of Chromebook And Google Workspace For Education Fundamentals

| Ref. | Metric | Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-------------------------------------|---|------------|---|-------------|-------------|-------------|-------------|
| D1 | Expected annualized cost of ransomware attacks on legacy student and teacher devices | Composite | \$1,150,000 | \$1,150,000 | \$1,150,000 | \$1,150,000 | \$1,150,000 |
| D2 | Reduction in successful ransomware attacks on student and teacher devices | Interviews | 100% | 100% | 100% | 100% | 100% |
| D3 | Percent of students and teachers using Chromebooks | B3 | 33% | 67% | 100% | 100% | 100% |
| Dt | Enhanced security of Chromebook and Google Workspace for Education Fundamentals | D1*D2*D3 | \$379,500 | \$770,500 | \$1,150,000 | \$1,150,000 | \$1,150,000 |
| | Risk adjustment | ↓15% | | | | | |
| Dtr | Enhanced security of Chromebook and Google Workspace for Education Fundamentals (risk-adjusted) | | \$322,575 | \$654,925 | \$977,500 | \$977,500 | \$977,500 |
| Five-year total: \$3,910,000 | | | Five-year present value: \$2,843,517 | | | | |

Quantified Educational Outcomes

Interviewees mentioned their organizations experienced the following quantified educational outcomes:

Improved Student Time On Task

Evidence and data. Of utmost importance to interviewed educational leaders was student outcomes and how Chromebook and Google Workspace for Education Fundamentals impacted student learning and time on task. Interviewees shared that giving students their own individual Chromebooks enabled access to a wide range of powerful tools. When teachers properly implemented the devices they dramatically improved the classroom experience.

- IT leaders sought to empower teachers with the best technological resources available. Leaders found these efforts translated into greater

educational outcomes for their students, such as time on task, national rankings, and material comprehension. Interviewees shared that educational outcomes improved above school peer groups after Chromebook and Google Workspace for Education enabled classroom improvements.

The IT superintendent of a Latin American K-12 school system said, “Having more technology in the classroom is extremely positive for our students and they get more access to qualified information.”

The same interviewee also said: “We’re investing in [Chromebooks and Google Workspace] because we want to be able to improve and move our schools up in the national ranking. We already have a lot of qualitative data about seeing improvement based on digital platforms.”

The IT manager of a school system in EMEA said, “I’ve noticed students prefer to take a test on Chromebook instead of paper because they get feedback faster and teachers can actually read their handwriting.”

- Much of the improvement from Chromebooks to time on task was attributed to the fast startup time of devices. Legacy devices took significantly longer and often delayed lessons.

The district edtech coordinator of a North American K-12 school district said, “Chromebooks typically boots up in about 8 seconds, whereas [legacy] take more like 4 minutes or more.”

The director of information and instructional technology of a North American K-12 school district said: “We really started buying more Chromebooks when we found out they turn on in 10 seconds. [Legacy devices] were still turning on after 2 or 3 minutes, and that’s if you didn’t have updates. I mean, it’s night and day difference. ... Chromebook is the best device on the planet to get you on the internet, to Google Docs, and to online collaboration [tools] as quickly as possible.”

The director of information and instructional technology of a North American K-12 school district said: “Let’s say you have a computer lab with 30 students. You tell everyone to start your computer, but then you get three hands that raise and say, ‘My computer says it’s running a service

pack.’ Well, now the class is down for 10 minutes. The fact that Chromebooks turn on in ten seconds made us say, ‘Oh my gosh.’ We immediately put in an order for 800 more, and by the very next fall we placed another order for 5,000.”

- Interviewees shared that the improved student engagement led to better student attendance. An EMEA K-12 school trust had net mobility of less than 5%, compared to a city average of over 20%. An interviewee contributed much of this difference to cultural and student engagement improvements leadership achieved with Chromebook and Google Education for Fundamentals.
- The director of new projects of a Latin American state said: “Google has had a very, very positive impact on students. They are more motivated and innovative. We see this in the production of their work. They can make videos, exhibitions, and presentations. They are participants in their own learning, and the use of the technology has been an important factor.”

Modeling and assumptions. Based on the interviews, Forrester assumes the following about improved time on task for students:

- Students save 20 minutes each week from Chromebooks starting up significantly faster than legacy devices.
- Students save an additional 5 minutes each week from Chromebooks updating faster and without manual effort.
- Students save 30 minutes each week from more effective collaboration from the use of Google Workspace for Education Fundamentals. This time also includes efficient reception and completion of assignments through Google Classroom.
- Of all time saved, 50% is recaptured and reinvested in improved educational outcomes.

| Improved Student Time On Task | | | |
|-------------------------------|--|----------------------------|---------|
| Ref. | Metric | Source | Savings |
| X1 | Time saved on device startup (minutes per week) | Interviews | 20 |
| X2 | Time saved on device updates (minutes per week) | Interviews | 5 |
| X3 | Time saved on collaboration and assignment work (minutes per week) | Interviews | 30 |
| X4 | Time recaptured | Composite | 50% |
| X5 | Improved student time on task (hours per week, rounded) | $(X1+X2+X3)*X4/60$ minutes | 0.46 |
| Xt | Improved student time on task (hours per year, rounded) | $X5*40$ weeks | 18 |

Reduced Teacher Labor

Evidence and data. Another top priority for interviewed educational leaders was improving the efficiency and work-life balance of teachers, who often carried heavy workloads and could struggle to meet all of their students' needs.

- Google Classroom, along with other services within Google Workspace for Education Fundamentals, gave teachers tools that made leading classrooms significantly easier. Students could participate much faster through their devices and teachers could gain insight into which students were struggling and focus their attention on them. In addition, Chromebooks started faster and had fewer technical issues when using features such as screencast and teacher-student chat.

The director of strategic partnerships of an EMEA K-12 school trust said: "Every teacher has access to Chromebooks and Workspace in front of them during their lessons, and it makes them able to be more efficient. Every child has access to a device that makes lessons more engaging, and therefore makes the children more likely to come. Chromebook and Workspace are a common thread of how we make our school more efficient."

The district edtech coordinator of a North American K-12 school district said: “Chromebook contributes to greater teaching quality. Teachers aren’t waiting for startup, the devices work better on the network, they are more stable, and it’s a unified platform environment with the students. With that comes engagement and teachers can have more time on task.”

The IT manager of an EMEA school system said: “The biggest difference we’ve noticed is from our teachers spending much less time to start a lesson. When you have a Chromebook, you just open it, and it works. With [legacy devices], sometimes they were busy for 5 to 10 minutes just to get all the students going. Feedback and revisions are also easier to keep track of, and teachers can give students corrections as they are working on assignments, rather than waiting for it all to be complete.”

The district edtech coordinator of a North American K-12 school district said: “Teachers can use Google Workspace to check the version history of a document and see who actually did what work. A lot of these tools have opened the lines of communication with students and let multiple kids work on one assignment together.”

- Teachers frequently reported issues with the battery life of their legacy devices, and these issues meant they could not teach as effectively in the classroom.

The district edtech coordinator of a North American K-12 school district said: “One of the reasons we decided to switch to Chromebooks was for our teachers. We had purchased [legacy tablets], and you were lucky to get 2 hours of battery. We did a pilot test of Chromebooks for teachers, and they could use it all day without having to charge it. They could actually walk around the classroom and not be tethered to their desk. Battery life is huge and is probably our number one reason for switching teachers to Chrome.”

The director of information and instructional technology of a North American K-12 school district said, “If I’m paying a teacher to teach, I want to make sure they’re able to teach 100% of the time. But if I give them an old [legacy] laptop that takes 5 minutes to boot up and you have to restart

the thing once every three days, I am losing thousands of dollars every year. Plus, you need devices to work right away because with the current attention spans of students, you'll be dead in the water if it takes 3 minutes to turn a device on.”

- The director of information and instructional technology of a North American K-12 school district said, “We get complaints from teachers that their [legacy] device is too old slow, and it's only two and a half years old. We just never hear that from those who use Chromebook.”
- Chromebooks and Google Workspace for Education Fundamentals also helped the quality of teaching and learning by providing instant feedback to teachers. The director of digital teaching and learning of an EMEA school trust said: “Our teachers have a lot more knowledge about their children because of the data that you can get by utilizing the technology. It happens in the moment in that lesson, and it's not waiting for the teacher to mark the book at the end of the lesson to find out that after class [that] the students don't understand. Chromebooks have been a huge part of this.”
- Teachers also saved time in lesson preparation by taking advantage of materials already available through Google Classroom. The IT manager of a school system in EMEA said, “We stopped a lot of our efforts working on classroom manuals because we figured out very quickly that Google has very good material already.”

Modeling and assumptions. Based on the interviews, Forrester assumes the following about saved labor for teachers:

- Teachers save 20 minutes each week from Chromebooks starting up significantly faster than legacy devices.
- Teachers save an additional 5 minutes each week from Chromebooks updating faster and without manual effort.
- Teachers save 15 minutes each week from more efficient communication with parents through Google Workspace for Education Fundamentals.

- An additional 45 minutes are saved weekly by using Google Classroom to automate portions of lesson preparation and allow for more efficient usage of curricular materials.
- Of all time saved, 75% is recaptured and reinvested.

| Reduced Teacher Labor | | | |
|-----------------------|---|---------------------------------|---------|
| Ref. | Metric | Source | Savings |
| Y1 | Time saved on device startup (minutes per week) | Interviews | 20 |
| Y2 | Time saved on device updates (minutes per week) | Interviews | 5 |
| Y3 | Time saved on parent communication (minutes per week) | Interviews | 15 |
| Y4 | Time saved on lesson preparation (minutes per week) | Interviews | 45 |
| Y5 | Time recaptured | Composite | 75% |
| Y6 | Reduced teacher labor (hours per week, rounded) | (Y1+Y2+Y3+Y4) *Y5/60 minutes | 1.06 |
| Yt | Improved teacher labor (hours per year, rounded) | Y6*40 weeks | 42 |

Unquantified Benefits

Interviewees mentioned the following additional benefits that their organizations experienced but were not able to quantify:

- **Grew student enrollment.** Several interviewees reported that their school systems rapidly expanded. In some cases for smaller schools, enrollment doubled in size over a period of three to five years. While many factors contributed to this expansion, interviewees found that the improvements enabled by Chromebook and Google Workspace for Education Fundamentals were a significant contributor to this growth.

The director of strategic partnerships of an EMEA K-12 school trust that had rapidly expanded in the past few years estimated that 70% of the new students who joined came because of improvements directly related to adoption of Chromebooks and Google Workspace for Education Fundamentals.

Student growth attributable to Chromebooks

70%

- **Reduced gap of student performance due to socioeconomic disadvantages.** Of primary concern for interviewed IT and educational leaders was providing tools to help students succeed regardless of their socioeconomic background. Chromebook was seen as especially helpful in this goal as school systems could afford to give each student their own dedicated device that they could take home each day and even during the summer.

The district edtech coordinator of a North American school district shared that for many families, this was the only computer they had access to in the home. This had not been possible previously, as the cost of legacy devices prohibited wider distribution and a 1:1 ratio between students and devices.

The director of strategic partnerships at an EMEA K-12 school trust said: “We've realized with Chromebooks that we need to move away from anything that needs to be installed on a device, and this opens up the ability for students to access the program from wherever they are. With [legacy devices], if you buy a program for that computer, you're basically saying it's a magic program for a magic computer. Not all students can afford to access that at home.”

- **Benefited from seamless integration between Chromebooks and Google Workspace for Education Fundamentals.** Interviewees found that the browser-optimized ChromeOS Chromebooks used worked especially well with Google Workspace for Education Fundamentals, leading to a better experience for teachers and students. This allowed school systems already using Google Workspace for Education Fundamentals to receive an even greater benefit than they had already achieved. Many schools also used educational learning tools available

through ChromeOS to provide additional educational benefits on top of the benefits of Google Workspace for Education Fundamentals.

The director of information and instructional technology said:

“Chromebooks have some really cool features built in, and they work better than anything else interacting with Google Workspace, Google Classroom, and Google Drive. Chrome[OS] is the best browser in the world, and that's all you need to get to Google Docs.”

The secretary of education of a Latin American state said: “When you are part of such a big system, it is very difficult to stay current. Thanks to this partnership with Google, we have [Google Workspace for Education Fundamentals] at no cost to the schools, to the teachers, or to the students. Above all, its quality is wonderful.”

- **Helped engage parents and guardians into the learning process, further improving educational outcomes.** Google Workspace for Education Fundamentals, including Google Classroom, allowed teachers to engage with students’ parents and guardians on a deeper level than had previously been possible. This reduced the burden on teachers to collaborate with large numbers of families, allowed greater transparency and visibility into student progress, and improved educational outcomes for students who had greater parental support than was possible before.

The district edtech coordinator of a North American K-12 school district said: “[Google Classroom] opened up the lines of communication with parents and it was all real time. They were able to see student grades, student assignments, announcements. We could never go without it again.”

The director of digital teaching and learning of an EMEA K-12 school trust said: “Chromebook has given students more independence and it's given them the continuity between home and school that they might not have had before. They can carry home whatever they've been learning in class and maximize the resources they have on their Chromebook. Parents can then learn more about what their students are doing at school and have more rich conversations with their children and help them improve.”

- **Allowed children with different abilities to be included.** While the cost savings of reducing specialty devices has already been accounted for, more important to educational leaders was allowing students with differing needs to feel included with their peers by using the same type of device. Chromebooks helped level the field among students by allowing for a unified platform and common experience that was still flexible enough to address a broad spectrum of needs.

The district edtech coordinator of a North America K-12 school district said: “These tools built into Chrome[OS] are really a lot of help for our students, and our accessibility has gone through the roof because of the devices. It allows students to feel mainstream. They don't want to be seen as different, and Chromebook has tools so they don't need a special device and can fit in better with other kids.”

The director of digital teaching and learning of an EMEA K-12 school trust said: “Workspace and Chromebooks are a considerable part of our inclusivity practice. It's about creating classroom environments that enable every child to succeed. Chromebooks and Workspace help change that culture to get every child access to all this support.”

“Early in our adoption, I remember one of my former students who struggled with a learning disability stated how the Chromebook allowed him to feel like every other student. This left a lasting impression on me and has been one of the reasons we have not shifted to a BYOD [bring-your-own-device] model.”

DISTRICT EDTECH COORDINATOR, K-12, NORTH AMERICA

- **Enabled children with different abilities to self-select the tools that make them most effective.** Teachers found that students often used accessibility features that best fit their own learning style without needing guidance when given access to a broader set of tools. This self-selecting culture allowed students to feel more in control of their experience and resulted in greater engagement and educational outcomes.

The district edtech coordinator of a North America K-12 school district said: “You have those kiddos that just won’t talk in front of a group, but they can type in their questions to the teachers. [The use of Chromebooks] opens that line of communication between teachers and students that are afraid to talk.”

- **Improved faculty collaboration.** Students used Google Workspace for Education to collaborate on projects and assignments, which not only led to greater depth of understanding but also allowed them to develop skills in teamwork. In addition, teachers and faculty members found that they were able to collaborate more effectively using Google Workspace for Education Fundamentals and saved time in their own projects.

The director of digital teaching and learning of an EMEA K-12 school trust said: “The need to collaborate was key. Being able to utilize something like Google Workspace was key as well because when we first started out, everybody was working separately in their own little schools with their own servers, and nobody was able to share.”

The IT superintendent of a Latin American K-12 school system said, “Many of our teachers today are at the lowest level of digital skills, but bringing Chromebooks into the school environment will help us invert this.”

- **Reduced repair costs.** Several interviewees shared that the cost to repair Chromebooks was significantly lower than legacy devices. This was in part attributed to the ease of replacing keyboards and other components as needed.

The director of strategic partnerships for an EMEA K-12 school trust said: “Chromebooks are much better in terms of a modular design. We can send them off to replace a component. Some other technology you just kind of

have to throw in a bin and buy a new one because they're not financially viable to repair. We can deploy Chromebooks in a green and sustainable way, and we also see a cost savings.”

A school system in EMEA was able to cut its repair costs by almost half due to Chromebook parts being less expensive than parts for its legacy devices. Repair costs fell even further as IT staff needed to spend less time removing viruses from student and teacher devices. The IT manager said: “You have a lot less security issues on Chromebooks, and that makes a difference to repair costs. They don't bring in a hard drive full of viruses. Most of the time, you need 5 minutes for a full reset and then you can move on.”

- **Additional savings from cloud operations.** Schools realized additional cost savings when they migrated from on-premises infrastructure to Google Cloud.

The director of strategic partnerships of an EMEA K-12 school trust said: “One of our schools had a server at the end of its life, and it would have cost an absolute fortune to find a new server if we hadn't moved to Google Cloud. There was a huge cost savings there by moving to the cloud”.

Flexibility

The value of flexibility is unique to each customer. There are multiple scenarios in which a customer might implement Chromebooks in education and later realize additional uses and business opportunities, including:

- **Better prepared students for future work.** Interviewees noted that Chromebook and ChromeOS usage in work settings has increased, so providing students with Chromebooks in the classroom today is helping them to be better prepared for future work environments. Forrester has similarly found that, while most enterprise environments use legacy devices today, there has been remarkable growth in Chromebook usage, especially for information workers.² Forrester expects that future technologies, such as 5G, will expand Chromebook usage in an anywhere context across more job types.³

- **Improved desirability to potential employees.** Having greater Chromebook and Google Classroom access made school systems more attractive to potential employees. This was in part because faculty members saw and shared the educational outcomes of effectively using these technologies in their classrooms. In addition, teachers' work was made more efficient, which helped to improve their work-life balance and reported satisfaction.

The director of strategic partnerships at an EMEA K-12 school trust said: "There are a number of ways that Chromebook and Workspace make us more desirable as an employer. We're a lot more flexible now with staff being able to work from home when they need. Also, having systems that are in the cloud allows the trust to be both creative and flexible and enables staff across the trust to work together and share resources. The technology has made us more desirable as an employer, and our staff satisfaction reflects that."

- **Reduced risk of employee attrition.** Interviewed educational leaders expected that the improvements enabled by Chromebook and Google Workspace for Education Fundamentals could help them retain employees longer. This was especially expected from improving the work-life balance of teachers who no longer needed to spend as long on lesson preparation, classroom management, and parental communication.

An EMEA K-12 school trust was able to improve its employee satisfaction by more than 15% above national benchmarks partially because of how effectively Chromebook and Google Classroom for Education Fundamentals were leveraged across the schools. While representatives from the school trust mentioned this achievement was the result of a multifaceted effort, they shared that this would have been more difficult to achieve without the improvements enabled by Chromebook and Google Classroom for Education Fundamentals.

- **Preparedness for future emergencies.** Forward-looking educational leaders learned the importance of preparing for emergencies from the recent COVID-19 pandemic. A key lesson many interviewees shared from that experience was that having remote capability for all students,

teachers, and faculty was no longer optional. That capability would help their resiliency in any future emergency situations.

The technology integration specialist of a North American K-12 school district said: “Having those Chromebooks in our kids' hands meant we were ready when the contagion hit. We had teachers reach out seven days after the shutdown asking if they could start teaching their students again. It was probably one of the proudest moments I've had in my career.”

- **Reduced environmental impact.** Educators were eager to find ways to reduce their environmental impact in the future and expected that the longer useable life of Chromebooks meant a reduction in e-waste.

The board of education director of an APAC K-12 school system said, “By extending the device replace cycle with Chromebook, we can reduce the environmental impact.”

Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in [Appendix A](#)).

“It almost sounds like we're paid by Google to say what we do about Chromebook, but we're in a high-stress environment and we're passionate about helping kids who are really struggling. So, when we find tools that help us help those kids, you almost can't not talk about it.”

DIRECTOR OF INFORMATION AND INSTRUCTIONAL TECHNOLOGY, K-12, NORTH AMERICA

Analysis Of Costs

Quantified cost data as applied to the composite

| Total Costs | | | | | | | | | |
|-------------|---|-----------|-------------|-------------|-------------|-----------|-----------|--------------|---------------|
| Ref. | Cost | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total | Present Value |
| Etr | Chromebook costs | \$0 | \$3,670,000 | \$3,670,000 | \$3,670,000 | \$450,000 | \$450,000 | \$11,910,000 | \$9,713,517 |
| Ftr | Labor for improved student and teacher outcomes | \$316,800 | \$213,840 | \$178,200 | \$142,560 | \$142,560 | \$142,560 | \$1,136,520 | \$951,469 |
| | Total costs (risk-adjusted) | \$316,800 | \$3,883,840 | \$3,848,200 | \$3,812,560 | \$592,560 | \$592,560 | \$13,046,520 | \$10,664,986 |

Chromebook Costs

Evidence and data. Interviewees’ districts that moved from legacy devices to Chromebooks had the cost of buying Chromebooks devices, even if they were less expensive than legacy devices. After initial pilot tests, schools often replaced legacy devices with Chromebooks in large numbers so that all students and teachers were using Chromebooks within two or three years.

- Interviewees expanded Chromebooks to most of their students and teachers. The district edtech coordinator of a North America K-12 school district said, “For the vast majority of users, Chromebook is just better hands down.
- Educational systems budgeted between \$250 and \$400 per Chromebook, with replace rates generally six years or longer.

The director of information and instructional technology for a North American K-12 school district said, “In a world where you have to spend at least \$800 for a basic machine elsewhere, Chromebook gets you the internet, Google Docs, collaboration, and web applications at \$300 a machine.”

- As Chromebooks were found to last longer than their planned replace rate, older devices were kept as spares in case a student caused damage to their Chromebook. This was particularly effective as the cloud-based nature of Chromebooks allowed this swap to happen almost instantly.

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- Students and teachers migrate from legacy devices to Chromebooks over a three-year period.
- Student Chromebooks cost \$300 each. Teachers receive Chromebook Pluses, which cost \$550 each.
- No additional peripheral devices are required for students or teachers using Chromebooks and Chromebook Pluses.
- The replacement rate for Chromebooks for students is five years, and the replacement rate for Chromebook Pluses for teachers is six years.
- Additional Chromebooks are purchased for students for spares and new student transfers. The number of additional Chromebooks purchased each year is equal to 5% of the total student population.

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- Just as with legacy devices, the cost of Chromebooks and Chromebook Pluses will vary depending on model, region, and other factors.
- While interviewees found that the replacement rate of Chromebooks was longer than the replacement rate of legacy devices, this could vary depending on school policy.

Results. To account for these risks, Forrester adjusted this cost upward by 0%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$9.7 million.

“The TCO [total cost of ownership] of Chromebook is lower than [our legacy OS]. Setup for Chromebook is by far the fastest for our employees, and device startup time is by far the fastest for our students. Therefore, the performance is much better compared to other operating systems.”

BOARD OF EDUCATION DIRECTOR, K-12, APAC

| Chromebook Costs | | | | | | | | |
|--------------------------------------|--|-------------------|------------|---|--------------------|--------------------|------------------|------------------|
| Ref. | Metric | Source | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| E1 | Number of students using Chromebooks | C1 | 0 | 10,000 | 20,000 | 30,000 | 30,000 | 30,000 |
| E2 | Number of students migrated to Chromebooks | Increase in E1 | 0 | 10,000 | 10,000 | 10,000 | 0 | 0 |
| E3 | Additional Chromebooks for spares and new student transfers | A3 | 0 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| E4 | Cost of student Chromebook | Interviews | \$300 | \$300 | \$300 | \$300 | \$300 | \$300 |
| E5 | Subtotal: Student Chromebook costs | (E2+E3)*E4 | \$0 | \$3,450,000 | \$3,450,000 | \$3,450,000 | \$450,000 | \$450,000 |
| E6 | Percent of teachers using Chromebooks (the same as students) | B3 | 0% | 33% | 67% | 100% | 100% | 100% |
| E7 | Number of teachers using Chromebooks (rounded to hundreds) | A8*E6 | 0 | 400 | 800 | 1,200 | 1,200 | 1,200 |
| E8 | Number of teachers migrated to Chromebooks | Increase in E7 | 0 | 400 | 400 | 400 | 0 | 0 |
| E9 | Cost of teacher Chromebook Pluses | Interviews | \$550 | \$550 | \$550 | \$550 | \$550 | \$550 |
| E10 | Subtotal: Teacher Chromebook Plus costs | E8*E9 | \$0 | \$220,000 | \$220,000 | \$220,000 | \$0 | \$0 |
| Et | Chromebook costs | E5+E10 | \$0 | \$3,670,000 | \$3,670,000 | \$3,670,000 | \$450,000 | \$450,000 |
| | Risk adjustment | 0% | | | | | | |
| Etr | Chromebook costs (risk-adjusted) | | \$0 | \$3,670,000 | \$3,670,000 | \$3,670,000 | \$450,000 | \$450,000 |
| Five-year total: \$11,910,000 | | | | Five-year present value: \$9,713,517 | | | | |

Labor For Improved Student And Teacher Outcomes

Evidence and data. In order to receive the greatest benefit of Chromebook and Google Workspace for Education Fundamentals, and shorten the adoption timeline, educational organizations allocated teachers and IT staff to train other teachers and staff on best practices for incorporating into classroom environments.

- Interviewed educational leaders who found the greatest benefit from Chromebooks were also those who invested in initial training to provide teachers and faculty with the resources they needed to be successful.
- Often, a few teachers who were more technologically proficient would volunteer to help train others. These teachers were paid for their additional time at interviewees' organizations.
- The learning curve for teachers to learn how to use Chromebooks and Google Workspace for Education Fundamentals was generally minimal. However, there were cases where some teachers needed additional time and training to effectively use all features.

The district edtech coordinator for a North American K-12 school district said: "We moved to Chromebook, and asked if the teachers if they had any questions. They just said, 'No, no I know how to do this.' The training curve went from hours to minutes."

- The IT superintendent of a Latin American K-12 school systems said: "The new role of the educator is a twenty-first-century role. Students are now digital natives. ... Teachers need to be innovative and they need to have a mastery of technology. Their new role is to help students discover and develop their digital citizenship."

Modeling and assumptions. Based on the interviews, Forrester assumes the following about the composite organization:

- For the first four months, 12 IT staff and teachers spend all of their time helping to integrate Chromebooks and Google Workspace for Education Fundamentals into the school environment and training staff and teachers on best practices.

- After the initial integration, six IT staff and teachers spend 60% of their time assisting with continued rollout and training during the school year. The amount of time they spend gradually declines over five years as less integration and training is required.

Risks. Forrester recognizes that these results may not be representative of all experiences and that the impact may vary depending on several factors:

- The amount of time required for training and implementing best practices varied between schools and staff. While this analysis assumes more training than interviewees reported their staff and teachers required, readers should consider their own needs.
- Training and implementation costs for Chromebooks and Google Workspace for Education Fundamentals were higher for schools where 1:1 student devices and general technology integration, such as networks and collaboration suites, had not yet occurred.

Results. To account for these risks, Forrester adjusted this cost upward by 10%, yielding a five-year, risk-adjusted total PV (discounted at 10%) of \$951,000.

“The switch from [our legacy OS] has not been complicated at all because the Google environment is very intuitive and is similar in some ways to the programs we had been using before. So, the migration from one system to the other has generally been flawless.”

IT MANAGER, K-12, EMEA

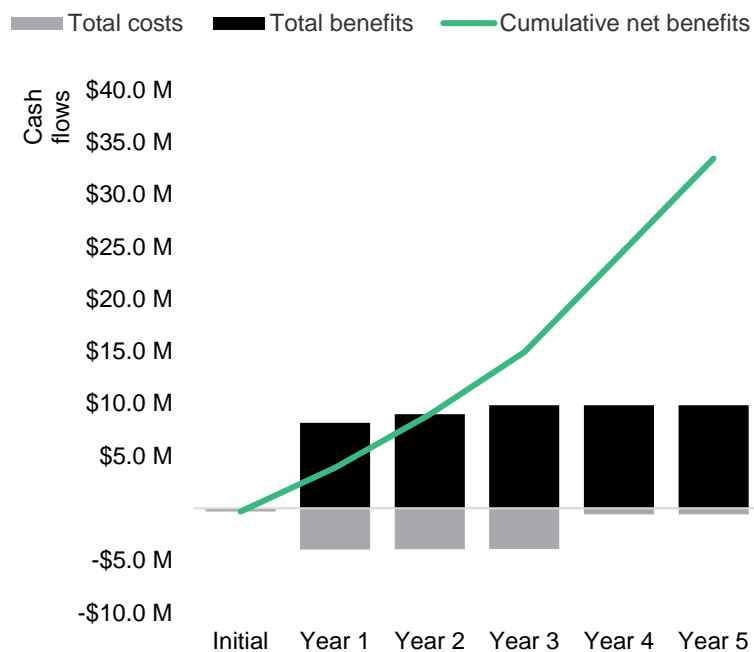
ANALYSIS OF COSTS

| Labor For Improved Student And Teacher Outcomes | | | | | | | | |
|--|--|---|---|---------------|---------------|---------------|---------------|---------------|
| Ref. | Metric | Source | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| F1 | IT staff and teachers reallocated to incorporate Chromebook best practices into classrooms | Interviews | 12 | 6 | 6 | 6 | 6 | 6 |
| F2 | Percentage of time spent on training and incorporating best practices | Interviews | 100% | 60% | 50% | 40% | 40% | 40% |
| F3 | IT support staff and teacher fully burdened salary | TEI standard | \$72,000 | \$72,000 | \$72,000 | \$72,000 | \$72,000 | \$72,000 |
| F4 | Months of year spent on integration and training | Interviews | 4 | 9 | 9 | 9 | 9 | 9 |
| Ft | Labor for improved student and teacher outcomes | $F1 \cdot F2 \cdot F3 \cdot F4 / 12$ months | \$288,000 | \$194,400 | \$162,000 | \$129,600 | \$129,600 | \$129,600 |
| | Risk adjustment | ↑10% | | | | | | |
| Ftr | Labor for improved student and teacher outcomes (risk-adjusted) | | \$316,800 | \$213,840 | \$178,200 | \$142,560 | \$142,560 | \$142,560 |
| Five-year total: \$1,136,520 | | | Five-year present value: \$951,469 | | | | | |

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 Cost section.

Cash Flow Analysis (Risk-Adjusted Estimates)

| | Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total | Present Value |
|----------------|-------------|---------------|---------------|---------------|-------------|-------------|----------------|----------------|
| Total costs | (\$316,800) | (\$3,883,840) | (\$3,848,200) | (\$3,812,560) | (\$592,560) | (\$592,560) | (\$13,046,520) | (\$10,664,986) |
| Total benefits | \$0 | \$8,162,481 | \$8,999,807 | \$9,856,438 | \$9,856,438 | \$9,856,438 | \$46,731,600 | \$35,115,733 |
| Net benefits | (\$316,800) | \$4,278,641 | \$5,151,607 | \$6,043,878 | \$9,263,878 | \$9,263,878 | \$33,685,080 | \$24,450,747 |
| ROI | | | | | | | | 229% |
| Payback | | | | | | | | <6 months |

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."

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.

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.

Appendix B: Supplemental Material

Related Forrester Research

["Improve Your Threat Protection Efficacy Using Built-In OS Security,"](#) Forrester Research, Inc., December 2, 2020.

Online Resources

More information about edtech is available at valueedtech.org

Appendix C: Endnotes

¹ 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.

² Source: "[The State of Chromebooks, 2022](#)," Forrester Research, Inc., March 11, 2022.

³ Source: "[The Future of Employee Computing](#)" Forrester Research, Inc., August 2, 2021.

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