The Total Economic Impact™ Of IBM And Red Hat For Telecommunications

How Customers Unlocked Business Value With IBM And Red Hat

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Technology savings and optimization:
$208 million

Workforce efficiency:
$93 million

Ability to attract, hire, and retain employees:
$14 million

Enhanced dependability:
$24 million

Executive Summary

The explosion of new technologies, connected devices, and bandwidth requirements is forcing telecommunications companies to make significant capex and opex investments to simply stay functional and relevant. Customer expectations are rising, even as telcos face increased competition from new communication and networking technologies.

As telcos look to innovate new offerings and improve customer experience (CX), they immediately face an ugly truth: Complex, siloed legacy systems with technical debt and outdated tools have built over decades of change and mergers and acquisitions. Telcos struggle with high employee churn as developers and IT pros grow frustrated with messy, inadequate technologies and culture focused on only "keeping the lights on."

Telcos must embrace cloud technologies, including in existing data center environments and new edge locations. 5G will accelerate application and services opportunities, and telcos are looking to container-based platforms and deployments, seamless app migration and integration solutions, cloud-based networking, edge computing, and AI for innovation.

Methodology. IBM commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by using solutions from IBM and Red Hat together in the telecommunications industry. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of IBM and Red Hat for their own organizations.

Primary data sources for Forrester's financial analysis

› **Interviews with 15 organizations** using solutions from IBM and Red Hat together, including six telecommunications companies.

› **Eighteen Forrester TEI studies with over 60 interviewed customers** published between 2018 to 2020 examining specific IBM or Red Hat solutions, including several telcos.

› **Annual reports and financial disclosures** for leading publicly traded companies in telecommunications and two other sectors.

› **Forrester's comprehensive market research**.

Using the data collected in this primary research, the following Total Economic Impact analysis illustrates the financial benefits, flexibility, costs, and risks that a *sample telco* experiences by investing in a comprehensive set of IBM and Red Hat capabilities. Findings are directly based on and representative of the interviewed customers' experiences.

This *sample telco* earns $60 billion in annual revenue, employs 75,000 FTEs including at least 400 in IT and 1,500 in development, and it maintains 780 applications across six data centers with 9,600 servers and 19,200 virtual machines (VMs). The *sample telco* conducts a three-year technology transformation in which it: 1) migrates one-third of its on-premises apps to the cloud; 2) deploys a hybrid multicloud container platform based on Red Hat Enterprise Linux (RHEL), Red Hat OpenShift, and IBM Cloud Paks across its on-premises hardware, IBM Cloud, and a third-party public cloud; 4) modernizes existing applications; and 5) leverages containerized services to drive innovation.

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**ROI
38%**

**Benefits PV
$352 million**

**NPV
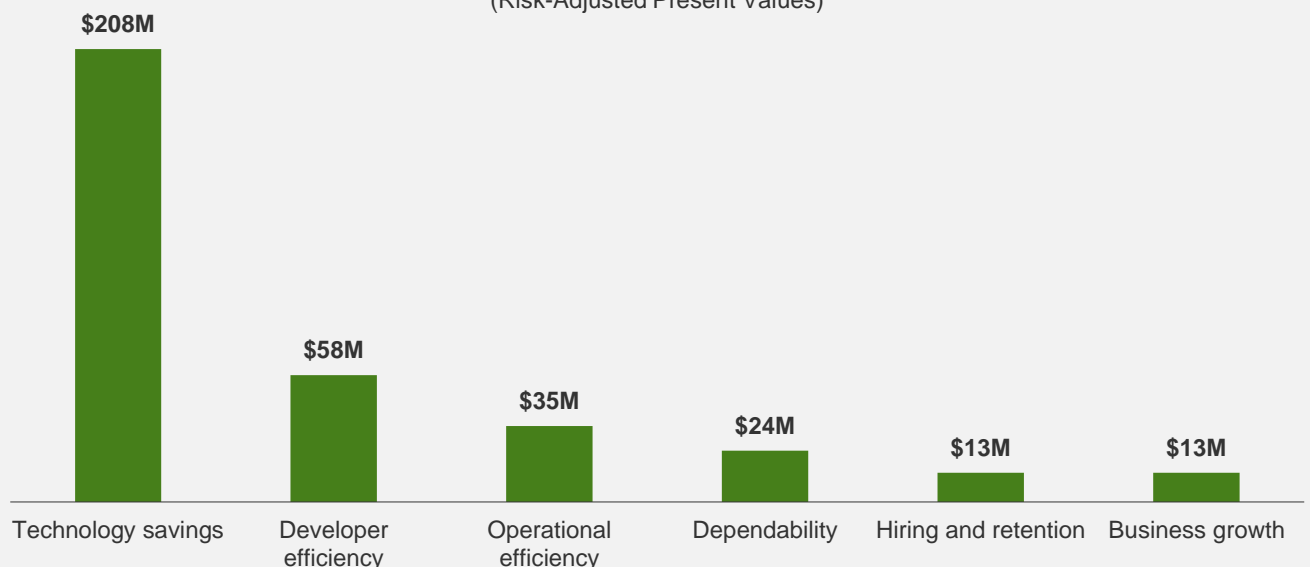$98 million**

**Payback
36 months**

Key Findings

Forrester interviewed IT leaders at telecommunications companies who turned to IBM and Red Hat to shore up, modernize, and propel their businesses in the future. IBM helped customers strategize and successfully modernize complex legacy environments. Using IBM and Red Hat solutions together, customers reduced IT expenditures, streamlined management, and gained greater flexibility and control over infrastructure. Developers released faster and could innovate with new technologies — improving CX and driving business growth.

Synopsis. Forrester's financial analysis found that the *sample telco* experiences incremental benefits of $352 million over five years versus incremental costs of $254 million by modernizing with a hybrid multicloud platform using IBM and Red Hat, adding up to a net present value (NPV) of $98 million, a payback period of 36 months, and an ROI of 38%.

Quantified benefits. Forrester modeled total benefits of $352 million over five years for the *sample telco*, including:

› Boosts revenue by $70 million, capturing $13 million in operating income with improved CX and new apps.

› Captures $58 million in additional productivity from 1,500 developers.

› Saves $52 million by migrating on-premises workloads to IBM Cloud.

› Saves $42 million by increasing data center resource utilization, $31 million by optimizing cloud spend, and $38 million by trimming software licensing with RHEL, Red Hat OpenShift, and IBM Cloud Paks.

› Reduces resource costs by $17 million by modernizing apps, prevents $23 million in excess spending for over-provisioning, and avoids $6 million in modeled price increases by reducing lock-in risk.

› Enhances dependability, avoiding $24 million in costs of downtime.

› Reallocates 138 IT and operations administrators, saving $35 million.

› Better attracts, hires, and retains employees, saving $14 million.

Five-Year Benefits For The Sample Telco
(Risk-Adjusted Present Values)

$208M	Technology savings
$58M	Developer efficiency
$35M	Operational efficiency
$24M	Dependability
$13M	Hiring and retention
$13M	Business growth

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> "Working with IBM and Red Hat is cheaper, better, and faster. We can use any server and environment, which lets us be open, efficient, and flexible."
>
> *Chief technology officer, multinational telco*

Unquantified benefits. IBM and Red Hat helped customers employ DevOps and Agile processes to release updates more frequently in smaller components and to use new technologies for business goals such as 5G adoption and disaster preparedness. IBM and Red Hat strengthened application and infrastructure security and helped to meet and report on stringent regulatory compliance needs. IBM and Red Hat enhanced employee efficiency for data, security, and support teams, improving employee experience (EX) and culture along the way.
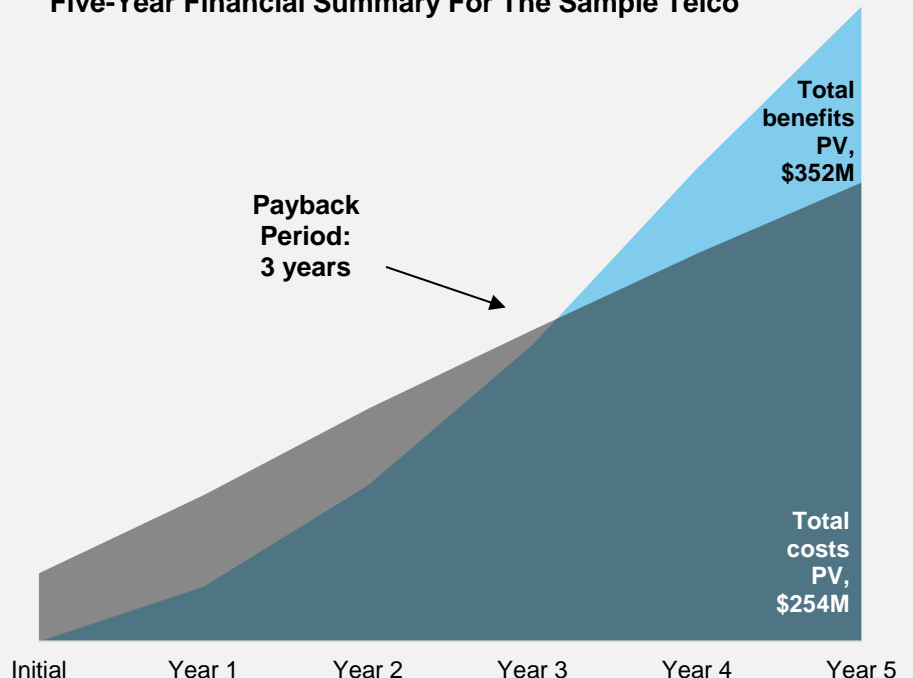
Flexibility. Customers gained flexibility and agility to respond to disasters and ensure business continuity, to do more with less, quickly adapt, reallocate resources, and innovate. They gained innovation opportunities by leveraging the broad catalogs of IBM and Red Hat services and by testing new AI, machine learning (ML), blockchain, and internet-of-things (IoT) capabilities, all while reducing their risk of proprietary technology lock-in by using leading open source components like Linux, Kubernetes, Knative, and Istio.

Costs. Forrester modeled total incremental costs of $254 million over five years for the composite organization, including:

› Technology costs of $144 million for cloud, platform, and software.

› Professional services costs of $49 million for transformation and $21 million for ongoing management and support.

› IT and developer training hours valued at $40 million.

Risks. Forrester has integrated an evaluation of risks and variability into all calculations in this financial analysis. Measuring and proving the impact of an expansive transformation (including hardware, cloud, software, and professional services) is unsurprisingly complex, with many influencing factors such as legacy environment, use cases, selected solutions, industry, region, size, and market trends. Forrester's financial analysis is a conservative representation of reported impacts from interviewed organizations, but ultimately, results will vary significantly by organization.

> "We're using IBM servers, IBM Cloud and public clouds from [two different third parties] with Red Hat Enterprise Linux, Red Hat OpenShift, IBM Cloud Pak for Multicloud Management, and IBM Cloud Pak for Data across the whole environment. We literally could not function without IBM and Red Hat working across it all."
>
> *Head of IT operations, secure payments and communications*

Five-Year Financial Summary For The Sample Telco

Total benefits PV, $352M

Payback Period: 3 years

Total costs PV, $254M

Initial | Year 1 | Year 2 | Year 3 | Year 4 | Year 5

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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 solutions from IBM and Red Hat together.

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 using solutions from IBM and Red Hat together can have on an organization:

DUE DILIGENCE
Interviewed IBM and Red Hat stakeholders and Forrester analysts to gather data relative to IBM and Red Hat.

CUSTOMER INTERVIEWS
Interviewed 15 organizations using IBM and Red Hat to obtain data with respect to costs, benefits, and risks.

MULTI-STUDY DATA REVIEW
Reviewed findings from eighteen recent Forrester Consulting studies of IBM and Red Hat solutions encompassing over sixty interviews and hundreds of survey respondents.

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 IBM and Red Hat's impact: benefits, costs, flexibility, and risks. Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves to provide a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

DISCLOSURES

Readers should be aware of the following:

This study is commissioned by IBM and delivered by Forrester Consulting. It is not meant to be used as a competitive analysis.

Forrester makes no assumptions as to the potential ROI that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the report to determine the appropriateness of an investment in IBM and Red Hat.

IBM 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.

Interviews with eight of the 15 customers were sourced directly by Forrester without the involvement of IBM, with the other seven customer names provided by IBM. Neither IBM nor Red Hat participated in any of the 15 interviews.

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

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Market Trends

Telecommunications Enters The New Decade

Telcos are plagued by complex, aging systems and technical debt.

Fueled in part by a history of constant mergers and acquisitions (M&A) with poor tech consolidation, telcos are managing massive and intricate tech portfolios of aging facilities, infrastructures, apps, and services. Technical debt is serious: Software has accumulated over decades with outdated middleware connecting poorly documented apps written in legacy coding languages. Simply maintaining the status quo is challenging and expensive enough; innovation seems unattainable.

High employee turnover rates further complicate this mess. Employees are frustrated using old technologies and aging systems and working in a culture focused on "keeping the lights on" rather than one of creativity and innovation. As staff members seek new opportunities, telcos lose essential expertise regarding internal systems. Rehiring is challenging, with few trained technology and industry specialists on the job market.

Pressure is rising from elevated customer expectations, increased competition, and the need to support new technologies.

The rise of mobile devices and IoT constantly pushes the number of connected devices ever-higher. Bandwidth demands are increasing for everything from websites and advertising to IoT and video conferencing to collaboration and gaming. Telcos also must support new capabilities such as 5G and end-to-end encryption. These trends pose serious challenges, forcing telcos to make major capex and opex investments in infrastructure and systems. As a result, operating costs continue to rise even while revenues for many remain stagnant.

Telcos know they must innovate to meet these growing customer needs, fend of market entrants, and cut costs, all while ensuring performance, availability, and security at all times for their legacy and new investments alike. While new technologies offer promise, they also bring risk and pose major challenges for deploying amongst the existing IT estate.

Massive data center investments thwart cloud migration for telcos.

Telcos have made massive investments in global data centers during the past several decades, powering the billions of communications pinging across the planet between people and technologies. Availability and low latency are crucial, and these data centers provide a degree of control.

However, telco data centers are becoming increasingly restrictive to important business initiatives to reduce operating costs, drive innovation, and handle business growth. Cloud technologies offer promise in all three categories, but migration is often untenable for telcos with hundreds of millions or billions invested in data centers.

Annual reports from top telcos show that many of these companies are accomplishing this goal by selling off their networks of data centers to major cloud and managed services providers, earning around $50 million per data center, and replacing them with contracts for managed services, private cloud, or public cloud. But this isn't feasible for all.

For everyone else, the cloud remains more difficult to access as the data center footprint is too large to simply spin down. These telcos must instead look to the cloud for targeted migrations and new development, while "bringing the cloud to the data center" for everything else.

"In choosing a vendor for cloud and open source, its products and services had to be cost-competitive, but the vendor also had to grasp the scale we needed with capabilities to implement what we were looking for."

Global operations manager, multinational telco

"The way Red Hat is doing things is a perfect world because it is preparing for both sides of the coin. [Red Hat] contributes to the open source community and [provides enterprise support] with very stable products."

Sr. manager of systems engineering, multinational telco

"We use Red Hat Enterprise Linux and OpenShift as a container platform for our entire on-prem environment. We also use OpenShift to manage containers in [several third-party public clouds]. For some of our products, our customers install containers on their servers, which manage remotely through OpenShift as well."

Product manager, telco equipment and services

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Forrester's Perspective: Disaster Preparedness And Business Continuity During A Global Pandemic

Disasters and recessions can cause massive disruption, and businesses must prepare to protect themselves. As of June 2020, the COVID-19 pandemic is having a profound impact on organizations, employees, and customers in every sector. Recession seems imminent, and no one is immune from travel restrictions to health and safety risks, from falling revenue to supply and demand shocks, and from near-immediate macro behavior changes to new market needs and expectations.

IT teams have been faced by an initial burst of triage activities and then a stoppage of nonessential and on-premises work.[1] IT teams must deal with surging traffic across the digital infrastructure — everything from employee communication to customer usage of digital channels — while these conditions threaten to turn preexisting minor application design flaws or infrastructure capacity constraints into major roadblocks.[2]

Telcos face significant challenges during the pandemic. Stay-at-home orders have driven up bandwidth use, with schoolchildren and remote workers newly relying on home networks for video conferencing while everyone else increases demand for streaming, gaming, and video calls with friends and family. Customers are constantly connected and under higher stress with nowhere to go, so they may notice and report outages or slowdown issues at much higher rates than normal — and they also likely face long and frustrating wait times.

Consumers may also find their income disrupted while B2B customers aggressively cut costs. Telcos will need to balance the desire to enforce contracts with the importance of leniency for waived fees and delayed payments in order to maintain all-important CX.

Meanwhile, telcos will also be challenged to maintain their data centers and worldwide infrastructures including lines, cell towers, and household access points. Going out will be a danger for employees, especially when multiple staff members are required, and it may not be feasible in all cases (such as house visits to set up cable). Telcos will find no easy answer for how to keep their employees safe and happy while also keeping their systems running under higher-than-normal loads.

As the pandemic takes a heavy toll on lives and economies, it may seem counterintuitive to launch major innovation campaigns. Yet, there may be no better time to creatively solve customers' problems and stake claim as an innovation leader and driver of change.[3] Organizations should:

› Increase, not decrease, the focus on innovation and speed using cloud technologies, containerization, open source, and Agile and DevOps practices. Organizations must design and deploy new and updated functionality faster and more radically than ever before to meet government, employee, and customer demands.

› Cut costs, control cash flow, and shift capex to opex with open source technologies, application portfolio rationalization, cloud container platforms, and consumption and subscription-based models.[4]

› Rely on consolidated monitoring, management, and automation to deliver business continuity amidst changing usage patterns and as a stopgap for disruptions in available employee resources.

› Beware of upticks in security risks from phishing, attempted breaches, and quickly deployed capabilities (potentially without best practices) while navigating quickly changing governmental regulations.
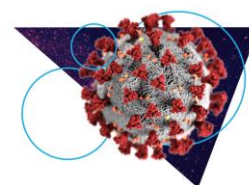
As the pandemic takes a heavy toll on lives and economies, it may seem counterintuitive to launch major innovation campaigns.

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Customer Journey

Interviewed Organizations

Forrester interviewed IT leaders from six telecommunications companies that are customers of both IBM and Red Hat to learn about their experiences utilizing capabilities from both companies in tandem.

› Five companies employ 50,000 to 300,000 FTEs and one company employs 500 FTEs (115,000 mean FTEs and 110,000 median FTEs).

› Four companies are multinational network, mobile, broadband, and media providers, one company specializes in telecommunications and networking equipment and services, and one company provides secure communications and payment services.

› All six companies operate on multiple continents, with four based in North America and two based in Europe.

Forrester also integrated data from the following sources:

› Nine interviews with financial services and transportation companies using solutions from IBM and Red Hat together.

› Findings from 18 recent Forrester Consulting studies on specific IBM or Red Hat solutions, which encompass over 60 interviewed companies and hundreds of survey respondents — including several telecommunications companies.

› Annual reports and financial disclosures for leading publicly traded companies in telecommunications and two other sectors.

› Forrester's comprehensive market research.

Key Challenges

Interviewed companies struggled with complex infrastructure, mounting technical debt, excessive downtime, and poor EX:

› **Decades of technical debt and M&A created tangled infrastructures and application environments.** Changes in hardware, operating systems, languages, middleware, and platforms over time that were complicated by M&A led to a confusing array of backwards processes, disjointed systems, and hard-to-identify dependencies. The resulting IT mess seemed nearly impossible to untangle — let alone to modernize — to drive innovation.

› **Telcos struggled to ensure performance and availability.** Networking and connectivity are central to telcos' business, as downtime causes remediation costs, support costs, and lost customers. Complex legacy IT stalled attempts to redesign apps and systems for performance and dependability, leading companies to instead overspend on excess resources to keep systems working.

› **Employees were frustrated by poor experiences with aging technology, and specialists were hard to find.** Churn was high, and companies lost crucial systems knowledge with turnover. It was difficult to rehire niche specialists for legacy work, creating business risk as companies needed experts to ensure mission-critical operations.

Interviewed telco customers used a range of the following solutions:

IBM
Blockchain
Cloud
Cloud Pak for Applications
Cloud Pak for Data
Cloud Pak for Multicloud Management
DB2
MQ
Power Systems
Services
Watson
WebSphere Liberty
Z Systems

Red Hat
Ansible
Enterprise Linux
Gluster Storage
Insights
JBoss EAP
JBoss Web Server
OpenShift
OpenStack Platform
Virtualization

"There has been a technological market shift for companies to migrate to the cloud and software-as-a-service. We needed someone who could support us in this transition. IBM and Red Hat are two of our key partners."

Global operations manager, multinational telco

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Partner Selection

The interviewed organizations searched for partners that could:

› **Combine the value of the data center and the cloud to drive innovation.** A multinational telco's chief technology officer said: "We are a massive user of IBM mainframes, and one of our biggest assets is our data centers. Now we are updating all our capabilities with open source and bringing in new pure native cloud capabilities. We are deploying all the new solutions in OpenShift containers. The infrastructure will be all virtualized and will do self-provisioning, self-maintenance, and automated deployment. We're also looking at the billing system, the packet core, and [other functions and subsystems]. Over the next three years, our entire environment will become a pure hybrid cloud, including all [50 to 100] data centers. This is a significant investment, with $100 million in capex and opex over three years."

› **Deliver dependability through hardware, software, and professional services.** The head of IT operations for a secure communications and payments company said: "IBM and Red Hat are the titans. IBM offers brand recognition and gravitas for our company." A multinational telco's global operations manager shared: "IBM is a highly thought of prime provider of services for our company. Combining [IBM] with Red Hat for expertise in their products is great."

› **Enable successful modernization with industry and technical expertise.** Telecos were plagued by technical debt, legacy infrastructures, disjointed systems from M&A, and stringent dependability requirements. They had very specific needs to enable the industry's massive scale. The director of digital transformation for a multinational telco explained: "For telecommunications, it's most important to be latency-free (<10ms), have near-perfect availability, and have massive scale in the industry. Our partners must also work with specialized languages such as Erlang that are the foundation of many industry applications. The industry needs are very specialized."

IBM And Red Hat Capabilities

Companies Forrester interviewed have invested in the following offering categories from IBM and Red Hat:

› **Hardware.** IBM Z and IBM Power Systems boosted security, performance, and value as compared to legacy hardware.

› **Cloud.** IBM Cloud allowed customers to access the flexibility and value of the cloud while meeting security and compliance needs.

› **Professional services.** A range of offerings from IBM Services and IBM Garage to Red Hat's container adoption program helped set strategies and taught companies to leverage modern containerization, microservices, and serverless architectures in the face of technical debt and stringent security and compliance needs.

› **Platform.** Red Hat OpenShift, RHEL, and IBM Cloud Paks provided the technology to consistently develop, monitor, and manage modern and legacy applications across hybrid and multicloud infrastructures (including hardware and cloud from IBM and third parties).

› **Middleware and services.** Organizations used prepackaged, containerized software from IBM and Red Hat catalogs including IBM WebSphere Liberty, DB2, MQ, Watson, or Blockchain and Red Hat Virtualization, Ansible, Insights, Gluster Storage, or JBoss.

"Anytime you work with open source, you have no idea what you are going to get. You need an adult in the room — and that is Red Hat. Red Hat packages, wraps, and supports the open source software. It provides nice management tools and updates and support for multiple instances."

Product manager, telco equipment and services

"Our development and engineering teams came out of roles with the military, financial market security, and cybersecurity. They weren't just comfortable with Red Hat — they swore by it. When we were choosing a vendor, they didn't even offer any other alternatives. Red Hat was the 'hands-down' choice."

Head of IT operations, secure payments and communications

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Telecommunications Model

Composite Organization

To model the Total Economic Impact of investing in solutions from IBM and Red Hat for a telecommunications company, Forrester aggregated findings to design a composite organization referred to as *sample telco* and an associated ROI analysis that is representative of the six interviewed telecommunications customers. The *sample telco* is a multinational B2C mobile and broadband provider that:

› Employs 75,000 FTEs.

› Earns $60 billion in revenue per year at a profit margin of 19%, earned from 100 million customers paying an average of $50 per month.

› Runs 720 apps out of six regional data centers with 600 server racks and 19,200 VMs.

› Runs 60 customer-facing apps out of a third-party public cloud.

› Employs 400 FTEs in IT and operations, earning an average fully burdened annual salary of $120,000.

› Employs 1,500 FTEs in development, earning an average fully burdened annual salary of $135,000.

Modeled Deployment

The *sample telco* conducts a three-year technology transformation (with a five-year economic analysis) including cloud migration, container platform implementation, and app modernization. The *sample telco*:

› Partners with **IBM Services** to: 1) strategize, plan, and conduct its data center transformation; 2) support adoption of IBM Cloud; 3) implement RHEL, Red Hat OpenShift, IBM Cloud Paks, and containerized IBM middleware while navigating technical debt; and 4) design best practices for modernization to ensure security, compliance, performance, and agility.

› Decommissions 120 server racks (33% of its total data center) over a four-year period, moving 25% of the 240 apps run using the infrastructure to **IBM Cloud** each year.

› Deploys **RHEL** with **Red Hat OpenShift, IBM Cloud Pak for Applications**, **IBM Cloud Pak for Multicloud Management**, and **IBM Cloud Pak for Data** to form a private cloud including its remaining data center hardware, its IBM Cloud environment, and a third-party public cloud environment.

> "We're deploying a coherent hybrid, multicloud environment with on-premises data centers that include IBM hardware, IBM Public Cloud, and other cloud vendors — all managed centrally via Red Hat OpenShift."
>
> *Global operations manager, multinational telco*

> "We are now more agile to deploy new products and offerings to our customers with this hybrid cloud solution. We can deploy new version releases faster. We can increase functionality. We can make our solutions more robust. And, on top of that, we have all our employees working together with this platform and [DevOps], and it's improving the culture of our company with a different way of working."
>
> *Chief technology officer, multinational telco*

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Analysis Of Benefits

QUANTIFIED BENEFIT DATA FOR THE SAMPLE TELCO

Total Benefits

| BENEFIT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Technology savings: optimize data center resources with platform management	$4,147,200	$8,294,400	$12,441,600	$16,588,800	$16,588,800	$41,603,329
Technology savings: decommission data centers with cloud migration	$5,184,000	$10,368,000	$15,552,000	$20,736,000	$20,736,000	$52,004,162
Technology savings: optimize cloud resources with platform management	$4,212,000	$6,463,314	$8,815,954	$11,273,418	$11,532,726	$30,655,041
Technology savings: optimize resources with app modernization	$631,800	$2,423,743	$4,628,376	$8,455,064	$8,649,545	$17,200,433
Technology savings: avoid over-provisioning with cloud scalability	$3,159,000	$4,847,486	$6,611,965	$8,455,064	$8,649,545	$22,991,281
Technology savings: reduce software licensing	$3,525,120	$7,095,146	$10,979,876	$15,740,140	$16,101,560	$38,066,285
Technology savings: avoid infrastructure lock-in	$0	$0	$458,122	$2,232,229	$6,020,065	$5,606,822
Operational efficiency	$2,244,000	$6,528,000	$10,710,000	$14,892,000	$14,892,000	$34,899,820
Developer efficiency	$5,591,040	$12,230,400	$18,170,880	$24,460,800	$20,467,200	$58,258,160
Attract, hire, and retain employees	$1,387,927	$2,733,581	$4,250,672	$4,884,750	$5,518,828	$13,477,610
Dependability	$2,671,554	$4,829,349	$6,987,143	$9,144,938	$9,144,938	$23,593,829
Business growth	$564,877	$2,206,669	$4,138,584	$6,070,500	$6,070,500	$13,362,133
Total benefits (risk-adjusted)	**$33,318,518**	**$68,020,088**	**$103,745,171**	**$142,933,701**	**$144,371,706**	**$351,718,905**

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Technology Savings

Benefit summary. Investments in cloud migration plus platform and app modernization allowed interviewed companies to eliminate data center operational costs, control cloud spend and licensing, and scale to meet peak demands. Organizations benefited from improved cash flow as they replaced upfront hardware and license purchases with usage-based subscription costs, while also reducing risk of vendor or infrastructure lock-in. Cost savings were linked with equivalent or better security, compliance, performance, and dependability across environments.

Impact to telecommunications. Interviewed telcos rely on networks of massive data centers to ensure availability, performance, and security. Although the companies recognized that the cloud offers much-needed innovation and cost reduction opportunities, scaling down or eliminating existing data centers wasn't tenable at this scale.

Instead, interviewed telcos built hybrid multicloud container platforms using RHEL, Red Hat OpenShift, and IBM Cloud Paks. Companies used IBM Cloud with this platform for new app development and scaling (like a pressure-release valve instead of additional hardware purchases), while also conducting targeted cloud migrations of apps from on-premises hardware that could be decommissioned or sold. Telcos also deployed this platform across their existing data centers and third-party clouds, consolidating application development, management, and monitoring across the entire hybrid multicloud environment. Telcos shared:

› **A multinational telco is boosting infrastructure efficiency by 30% to 35% and can now shift 40% of its capex to the cloud, gaining flexibility and reducing risk.** The chief technology officer explained: "Our savings come from three categories. First, we can make our hardware multipurpose and just pick what we need for speed, storage, networking, and so on. The second level is software: using open source and picking the right vendor for whatever we need. The final level is to use cloud-native solutions, containers, Kubernetes, orchestration, and so on."

› **A global secure payments and communications company met double-digit business growth while controlling costs.** It displaced higher on-premises costs with its IBM Cloud investment while gaining the ability to scale to meet double-digit sales growth and gaining flexibility to innovate with new technologies.

› **A telco equipment and services company deployed IBM and Red Hat's platform in its data centers while using IBM cloud for customer-facing app development.** A product manager shared, "As [a telco], we can't be reliant on another vendor's infrastructure for the core of our business. We need superb quality, latency, and availability. It takes a lot, and we only can guarantee that with our own data centers and building huge data pipes between them. So, while we use the cloud for a lot, including many customer-facing elements, we don't plan to use it for the core functionality of our business."

› **One multinational telco reduced its total cost of ownership for both IT infrastructure and licensing while gaining opportunity for innovation.** Using containerized services reduced costs as compared licenses deployed to each VM, while the container platform drove increased utilization in the data center. Meanwhile, the company could continue to meet stringent availability requirements while also adopting enterprise-grade versions of open source technologies for innovation.

$208 million five-year benefit PV

12% 15% 9% 5% 6% 11% 1%
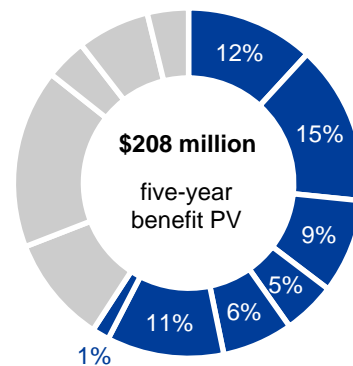
Technology savings: **59%** of total benefits

"Over the next three years, we will shift our capital expenditures from 70% mainframe to 30% mainframe [for new environments]."

Chief technology officer, multinational telco

"Red Hat gives you efficiencies, management, open source, and automation. It all comes with it. OpenShift helped sell all of IBM's portfolio, because it is letting us use many component pieces and use them tighter and better integrated."

Global operations manager, multinational telco

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> **A multinational telco is reducing licensing and gaining flexibility with Red Hat OpenShift in its data centers and cloud.** The global operations manager shared: "We have diverse hybrid, multicloud operations. Red Hat OpenShift will manage the disparity of public and private cloud infrastructure. . . . We will save money and gain flexibility to do more by being able to pick and choose pieces of software."

Financial model. The *sample telco*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of $208 million:

> **Boosts data center resource utilization by 20% with RHEL, OpenShift, and IBM Cloud Paks, saving $42 million.** The *sample telco* decommissions 96 server racks, saving $128,000 in annual operational costs and avoiding $320,000 five-year refreshes per rack.

> **Avoids $52 million in hardware refresh and operational costs by migrating workloads to IBM Cloud.** The *sample telco* migrates 120 server racks over four years, saving $128,000 in annual operational costs per rack and $320,000 per refresh at a five-year refresh cycle.

> **Optimizes cloud costs with platform management, improving density by 20% to save $31 million.** Containerization and management using Red Hat OpenShift and IBM Cloud Paks reduces workload resource requirements by 20% in both IBM Cloud and a third-party cloud, saving approximately $40,000 per app, per year.

> **Reduces resource requirements by 30% for modernized apps, saving $17 million.** The *sample telco* refactors and modernizes 150 apps over four years using microservices and serverless architectures plus prepackaged cloud services. Modernization reduces consumption by approximately $61,000 per app, per year by rationalizing resource needs, allocating resources at the microservices level, shutting down idle workloads, and further boosting infrastructure density.

> **Prevents 15% in excess infrastructure, avoiding $23 million in potential costs.** The *sample telco* scales cloud resources as needed with usage-based pricing to avoid over-provisioning for peak loads.

> **Trims software license costs by 15% for containerized apps and by 35% for apps refactored with modern architectures, saving $38 million.** The *sample telco* containerizes 780 apps in the IBM and Red Hat platform and modernizes 150 of them. As a result, it decreases the number of licenses by decreasing servers, VMs, and workload requirements, and by finding and ending idle workloads.

> **Diminishes risk of lock-in to rising costs, avoiding $6 million in modeled cost increases.** The *sample telco* gains workload portability to any on-premises and cloud environments that supports z/OS, RHEL, Red Hat OpenShift, or IBM Cloud Paks. With modeled annual price increases for infrastructure and licenses tied to 2.3% inflation, the *sample telco* evaluates alternate solutions due to pricing pressure and changing marketplace dynamics beginning in Year 3 with a 10% to 50% chance in Year 5 of exercising the flexibility gained through portability and changing solutions or vendors.

> **Faces impact risks of 10% that may cause realized savings to be less than modeled.** Factors include: 1) variability in a company's legacy environment, selected IBM and Red Hat products, and desired use cases; 2) unpredictability in pricing including selected solutions, discounting, and regional variation; 3) risk of delayed or limited implementation success preventing recognition of benefits; and 4) broader market forces impacting business needs and costs.

The sample telco:

- Boosts resource utilization for the data center by 20%, saving $2M.

- Migrates workloads from legacy hardware to IBM Cloud, saving $52M.

- Optimizes cloud costs with platform management by 20%, saving $31M.

- Reduces resource demands for modern apps by 30%, saving $17M.

- Prevents excess overhead of 15%, saving $23M.

- Trims software licensing by 15% for containerized apps and by 35% for modernized apps, saving $38M.

- Diminishes risk of lock-in, avoiding $6M in modeled price increases.

"Comparing bare metal to containers, we are getting infrastructure efficiencies of around 30% to 35%."

*Chief technology officer, multinational telco*

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Workforce Efficiency

Benefit summary. Interviewed telcos consolidated systems and adopted containerization using RHEL, Red Hat Virtualization, Red Hat OpenShift, and IBM Cloud Paks. Containerization streamlined management and monitoring without needing to reinvent applications themselves, and it allowed telcos to deploy new prepackaged services and modernize apps more easily. Complexity was abstracted, code was broken down into simpler isolated elements, and integrated services were consumed in prepackaged containers — saving time for developers to create and maintain apps and administrators to automate and streamline processes from deployment to spin-down. Even legacy apps lifted and shifted to containers were managed more efficiently and effectively.

Impact to telecommunications. The interviewed telcos wanted and needed to modernize and improve efficiency. The IBM and Red Hat platform helped them reap cloud and open source benefits with enterprise-grade dependability, security, and compliance. IT and development teams freed themselves of burdensome, complex processes and set up centrally enforced governance with preapproved, prepackaged containers for services. Specialized teams could now share workloads more easily, freeing resources to work on higher-value work.

Interviewed telcos shared:

› **One multinational telco projects that it will reduce labor waste by 40% with the consolidated IBM and Red Hat platform.** The chief technology officer explained: "We are still rolling out our hybrid cloud solution. But as we switch people over, we are expecting more than a 40% increase in efficiency with self-provisioning capabilities, automation, and its other functionalities."

› **Another multinational telco found Linux and containerization to be key to control without confusion, delighting IT and development professionals.** The company views RHEL as the de facto operating system for containers and virtual machines. It certifies the hardware, provides control, avoids confusing hooks and callbacks, and makes things easy. The director of digital transformation said, "Developers love it!"

› **A third multinational telco consolidated its hybrid multicloud with Red Hat OpenShift and IBM Cloud Paks, starting to save labor while gaining innovation opportunities.** The global operations manager shared: "We're streamlining so the entire system is coherent. Then we can use open source to make solutions and deploy them across the network and different operating systems. Employees will be more efficient using the same software and versions, and it opens the door to new opportunities for modernization and monetization that we couldn't do otherwise. We want employees creating things that drive growth for the company, not doing busy work."

› **A global secure payments and communications company has significantly increased the efficiency and productivity of its IT and development labor.** This drives cost savings for both internal employees and professional services despite booming business growth.

$93 million
five-year benefit PV

16%

10%
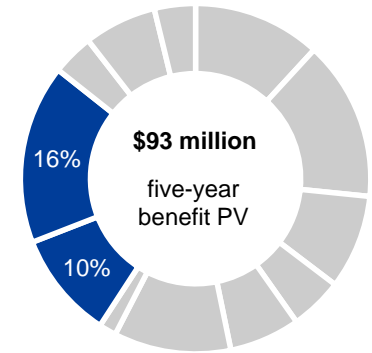
Workforce efficiency: 26% of total benefits

"Transformation is mandatory. It simplifies things. It lets us move faster. It improves culture. But cultural change is not something you can do in a day. It evolves slowly. Today, our people are still managing all these legacy systems. We need to get to a point where we've fully made the change to really change the culture."

Chief technology officer, multinational telco

"We see a lack of knowledge about physical products and legacy applications that have been around forever. Their architecture is bad or old, and converting them or moving them to a cloud environment is very time-consuming to figure out what can do it and how it can be moved."

Sr. manager of systems engineering, multinational telco

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Financial model. The *sample telco*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of $93 million:
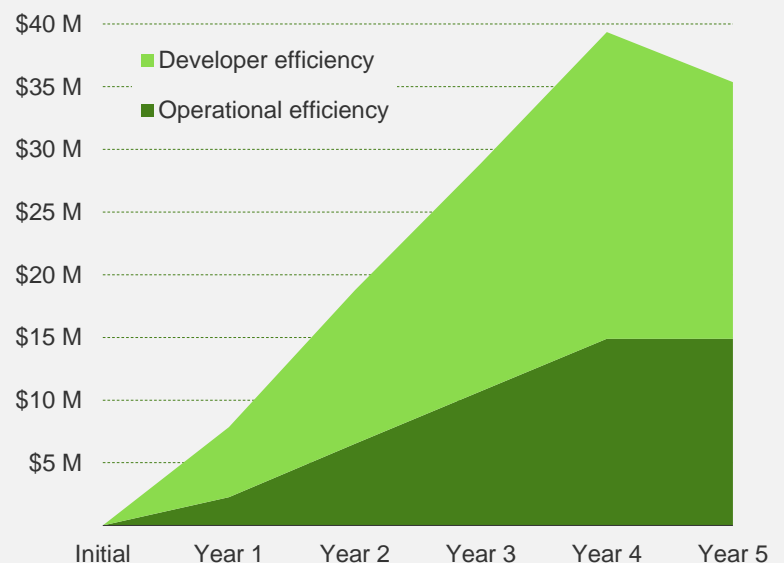
› **Reallocates 10% of infrastructure admins for its data centers by deploying the IBM and Red Hat platform.** The *sample telco* begins with 120 admins (20 per data center), 12 of which are shifted to other value-add tasks by Year 4 (two per data center).

› **Reallocates all infrastructure admins for environments migrated to the cloud.** The *sample telco* begins with 60 admins for this segment (10 per data center), 25% of which are shifted each year to other value-add tasks with all FTEs reallocated by Year 4.

› **Reallocates 70% of middleware admins by using prepackaged services from IBM and Red Hat catalogs.** Five percent of the *sample telco*'s 60 middleware admins (each specializing in a different technology) are reallocated in Year 1, followed by 30% in Year 2, 50% in Year 3, and 70% in Year 4 and beyond.

› **Boosts productivity for platform and operations administrators by up to 40%.** The *sample telco* improves efficiency for its 160 admins with streamlined monitoring, management, and automation in a single hybrid multicloud solution with improved user experience (UX), with 50% of time savings recaptured for added business value.

› **Accelerates app development by 33%, reducing timelines from 36 weeks to 24 weeks.** The *sample telco*'s eight-person teams eliminate environment wait time, streamline service integration with prepackaged containers, and code faster with improved, consolidated UX. Teams deliver apps with 90% fewer errors, which combined with automation, slashes time needed for testing and deployment.

› **Decreases annual maintenance labor by 8% for containerized legacy apps.** With the IBM and Red Hat platform, teams reduced annual maintenance per app by one week due to automation, consolidated tools, prepackaged services, and improved UX.

› **Cuts annual maintenance labor for modernized apps by one third.** Microservices architectures shave another two weeks per year off the typical 12 weeks required for app updates and maintenance, as work is streamlined with fewer dependencies and lower complexity.

› **Faces impact risks of 15% for IT and 20% for developer savings that may cause realized savings to be lower than modeled.** Factors include: 1) variability in a company's legacy environment, selected IBM and Red Hat products, and desired use cases; 2) size of IT and development teams; 3) typical employee salaries; 4) risk of delayed or limited implementation success preventing recognition of benefits; and 5) broader market and regulatory forces impacting business needs and internal processes. Developer savings are more dependent on cultural and process shifts to DevOps and Agile, leading risk to be higher than for IT teams that benefit from a higher level of direct solution impact.

The sample telco:

- Reallocates 146 IT and operations administrators, saving $35M.

- Boosts productivity for 1,500 developers, saving $58M.

Annual Labor Savings For The Sample Telco

Legend: Developer efficiency, Operational efficiency

y-axis: $5 M, $10 M, $15 M, $20 M, $25 M, $30 M, $35 M, $40 M

x-axis: Initial, Year 1, Year 2, Year 3, Year 4, Year 5

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Hiring And Retention

Benefit summary for telecommunications. Complex, legacy, siloed systems and technical debt caused particularly poor EX for telco IT and development teams. Employees wasted time on manual processes, struggled to figure out systems, faced roadblocks, and grew frustrated with company cultures that lacked creativity and vitality.

As a result, IT and development employee attrition was particularly high for telcos. Companies struggled to find specialists to work on niche and outdated technologies, and it was difficult and expensive to attract employees to work in the industry. Further, employee attrition created significant risk for telcos as they not only lost technology expertise but also expertise in their company's specific intricacies.

Replacing legacy infrastructure and tools with the IBM and Red Hat hybrid multicloud container platform helped the telcos retain employees and addressed pressing talent search needs Now, companies can access a larger workforce with skills in Linux, Kubernetes, and Java or with specific IBM and Red Hat knowledge. Not only was the talent pool larger, but it was easier to attract, hire, and retain employees due to better EX from more modern, intuitive, and consolidated solutions. Telcos shared:

› **A multinational telco boosted EX for development and IT, seeing a year-over-year uptick in retention.**

› **Another multinational telco can now better attract, hire, and retain talent with modern IBM and Red Hat technology.** It was losing key product knowledge and technical expertise from employee departures, risking the company's CX, dependability, and future growth.

› **A third multinational telco was stuck with old code and technology from the '90s and '00s.** The company needed to reduce employee-impacting downtime and help employees work faster with less frustration, turning to IBM and Red Hat to transform their operations.

Financial model. The *sample telco*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of $14 million, reducing hiring costs by 10% and boosting retention by 5%. Changing culture is notoriously difficult, especially for large telco companies.

Improved retention and hiring costs are driven by new technology and enhanced by cultural change from adoption of DevOps and Agile processes, collaboration, and ability to innovate. Driving cultural change is key to this benefit. To ensure conservatism, Forrester has incorporated a very high risk-adjustment of 25% into this calculation.

4%

$14 million

five-year
benefit PV
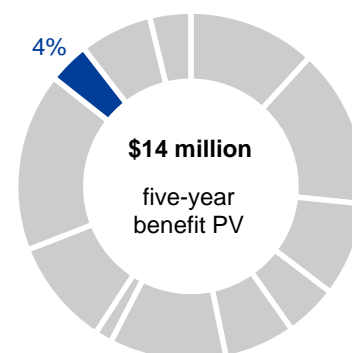
Hiring and retention: **4%** of total benefits

"We've had a significant departure of people, and it's hindering progress towards our goal. The biggest part is that institutional knowledge. We aren't just losing product knowledge and how the process works, it's also how the application is designed to work. All that knowledge is going to improve [with IBM and Red Hat] because we will see the application point of view and the infrastructure point of view, and then we will do all the tracing on data flows and similar."

Systems architect, multinational telco

Hiring And Retention: Calculation Table

| REDUCED HIRING COST	IT HIRING COST	DEVELOPER HIRING COST	RETENTION IMPROVEMENT	RETENTION IMPACT	RISK ADJUSTMENT
10% cheaper	$60,000 (50% of salary) decreases to $54,000	$67,500 (50% of salary) decreases to $60,750	5% better	75% increases to 78.8%	Extremely high (25%)

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Dependability

Benefit summary. Eighty-five percent of companies face unplanned downtime at least every other month, with an average of 830 minutes per year at a cost of $5.6 million per year.[5] Organizations significantly improved dependability by modernizing with IBM and Red Hat, accessing enterprise-grade versions of open source technologies and leveraging robust hardware, cloud, and platform offerings. IBM Cloud provided high-performance, secure, dependable infrastructures to run applications and store data. Meanwhile, RHEL, Red Hat OpenShift, and IBM Cloud Paks provided platform services to connect infrastructures, data, and apps with consistent monitoring and management to catch, fix, and prevent issues to ensure availability, performance, and resiliency. As a result, companies significantly reduced user-impacting downtime.

Impact to telecommunications. Dependability is at the core of telco businesses — they must prevent downtime and ensure extremely low latency, or risk losing customers. Interviewed telcos trusted IBM and Red Hat to provide enterprise-grade hardware, software, and professional services to deliver the dependability they needed. Telcos shared:

› **IBM and Red Hat enabled a multinational telco to deploy IoT devices with monitoring, automation, and AI across the environment to identify and fix issues as quickly as possible.** The global operations manager shared: "For [telcos] with infrastructure across the country, you often don't know there's a problem unless someone sees a line is down. Improving our systems infrastructure will help it become self-managing and self-predicting in real time."

› **The telco equipment and services company adopted solutions from IBM and Red Hat to improve dependability**. The product manager said: "We have had catastrophic failures. We know what downtime means. We lost customers, we had to give away [our offerings] for free, and we wasted excess labor. And with telco, downtime means a lot. Especially when it's an hour, then a day, or even a week. Our customers are totally dependent on us, so it's business-critical. We don't just offer some nice-to-have. That's why we have to be constantly de-risking and finding ways to ensure availability and performance at all times."

Financial model. The *sample telco*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of $24 million, slashing unplanned downtime by 95% within the IBM and Red Hat environment.

$24 million

five-year benefit PV
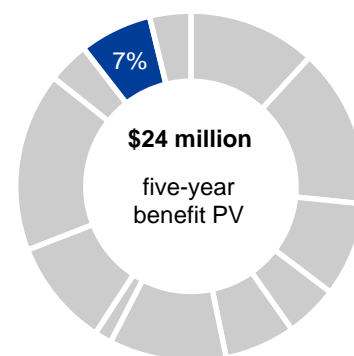
Dependability: 7% of total benefits

> "We have had catastrophic failures. We know what downtime means. We lost customers, we had to give away [our offerings] for free, and we wasted excess labor."
>
> *Product manager, telco equipment and services*

Dependability: Calculation Table

Annual remediation cost of unplanned downtime	Downtime reduction	Percent of environment in IBM and Red Hat platform	Risk adjustment
$5.6 million	95%	29% in Year 1 rising to 100% by Year 4	High (15%)

Type of downtime	Per-customer chance of experiencing downtime	Likelihood to call support	Support cost	Typical credit	Likelihood to issue credit
More than 1 hour	1%	25%	$8 per call	$25 credit	20% likelihood
More than 8 hours	0.1%	75%	$8 per call	$50 credit	50% likelihood

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Business Growth

Benefit summary. Interviewed customers shored up environments using hardware, platforms, and services from IBM and Red Hat to guarantee performance, availability, and dependability which boosts CX and drives revenue via retention and enrichment. Transformation with IBM and Red Hat enabled developers to release equivalent capabilities at least twice as fast, with much more frequent incremental updates delivering value to customers as fast as possible. The investments also enabled developers to connect all their existing data to mine and capitalize with new data models and new applications. Combined with new capabilities driven by packaged services from IBM and Red Hat catalogs (including AI, blockchain, and IoT), it ultimately generated additional business growth.

Impact to telecommunications. Facing increased market competition from traditional telcos and modern communication or networking solutions, the interviewed telcos knew they must shore up their CX while also investing in new product offerings — all while guaranteeing availability and speed. By deploying hybrid multicloud container platforms with IBM and Red Hat, they could finally shift teams to innovation with open source, AI, blockchain, IoT, Edge, and software-as-a-service (SaaS) integrations instead of just "keeping the lights on." Telcos shared:

› **A multinational telco plans to use packaged services tactically to drive growth.** In the past, needing to purchase and deploy an entire solution prevented innovation. With Red Hat OpenShift and IBM Cloud Paks, the telco can now use open source and vendor solutions in containers only when needed. For example, it uses IBM Watson to target AI use cases or integrate a third-party customer relationship management (CRM) or enterprise resource planning (ERP).

› **Another multinational telco launched a new product for its customers based on hybrid multicloud architectures.** The company built a B2B cloud computing model built on IBM and Red Hat, providing end customers with a new solution that has portability to avoid lock-in with a platform based on Kubernetes and Linux. The telco generated at least five new customers in its initial go-to-market phase, boosting revenue with a new income stream.

› **A third multinational telco described enhancing its existing apps with IBM Watson.** The company hopes to improve CX and shorten task time by using AI within the apps.

› **A global secure payments and communications company earned market trust and expanded offerings, boosting revenue.** The IBM and Red Hat platform enabled the company to specialize and expand offerings with security and regulatory compliance that satisfied government, financial, fiduciary, and cryptocurrency clients. It delivered work for clients faster, cheaper, and with greater customization, and it offered more seamless experiences. The company also leaned on market trust in IBM and Red Hat to strengthen its own brand perception. In one case, the company secured a major multiyear government contract leveraging IBM Cloud, Z, and Watson along with Red Hat Virtualization, Gluster Storage, and OpenShift driving significant revenue. The head of IT operations said: "IBM and Red Hat are the titans. The duality of using both companies offers our clients confidence in us, because they have confidence in IBM and Red Hat. It's actually lowered our cost to acquire a new customer because it gives prospects trust in our business."

4%

$14 million

five-year
benefit PV
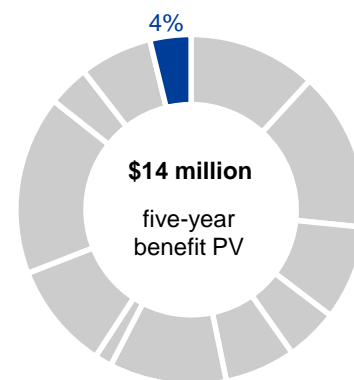
**Business growth:
4% of total benefits**

"By deploying our hybrid cloud platform [built with Red Hat and IBM], we gained the opportunity to delve into markets and industry segments that weren't on our radar before. It let us specialize in new ways and monetize more things. Overall, it increased our revenue."

Head of IT operations, secure payments and communications

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Financial model. The *sample telco*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of $14 million. Platform-driven CX and dependability reduces the 1.1% annual customer churn (based on B2C telco industry averages) by 1%, delivering up to $1 million per year in operating income. The launch of six new customer-facing apps drives a 20% upsell in monthly charges for 0.05% of customers per application, boosting operating income by up to $6 million per year.

Modeled business growth is representative of interviewed customers. However, Forrester levied a very high risk adjustment of 25% as impact to revenue will vary widely for every telco organization due to: 1) broad market trends; 2) specific use cases and solutions deployed; 3) typical revenue driven by baseline customer behavior via retention and enrichment; and 4) the number and purpose of new modern apps deployed using IBM and Red Hat.

Business Growth: Calculation Table					
CX-DRIVEN RETENTION	**ENVIRONMENT IN IBM AND RED HAT**	**NEW APPS DEVELOPED**	**PER-APP REVENUE OPPORTUNITY**	**OPERATING MARGIN**	**RISK ADJUSTMENT**
1% reduction to 1.1% baseline annual churn	29% increasing to 100% by Year 4	60 total; at least 6 customer-facing	20% upsell with 0.05% adoption	19%	Extremely high (25%)

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Unquantified Benefits

The interviewed organizations identified a range of other benefits they experienced that were either unique to their business or that they could not yet quantify. Unquantified benefits include:

› **Increased release frequency.** Companies were more successful at deploying DevOps and Agile processes in the new environment, which helped them adopt microservices and ultimately release more frequently in smaller components and get value to end users faster.

› **Improved security and compliance.** The future of computing will be multicloud and hybrid, and if security leaders thought their footprints of digital assets were already difficult to protect, it's only going to get worse.[6] Companies must prevent breaches, as they pose immense risk in remediation costs, lost sales, and regulatory fees. They must also clearly monitor and report on environments and policies to prove compliance. This can be very expensive and challenging to show, let alone to ensure — especially given stringent rules from the California Consumer Privacy Act (CCPA) and the General Data Protection Regulation (GDPR). Interviewed customers were able to secure, monitor, and demonstrate their adherence to the strictest security and regulatory standards while also streamlining the process — saving labor and avoiding remediation costs, fines, and lost sales.

  • The head of IT operations for a secure communications and payments company explained: "IBM and Red Hat are the titans. We are running on IBM Cloud for our fiduciary and encryption requirements. AES 56 is the bread and butter of IBM Cloud. Further, IBM offers brand recognition and gravitas for our company when customers learn that is what we are using." Red Hat is crucial as well. He continued: "RHEL helps us manage compliance for our containers across 50 states and 22 countries. It lets us manage the security, cost basis, region, and compliance needs for each individual customer of ours and the regulatory agencies in their states and countries."

  • The chief technology officer for a multinational telco explained the company's approach: "We need to strictly control and follow who accesses our systems and what they can access to guarantee we meet the Sarbanes-Oxley Act. But with [our current environment], it's just impossible to imagine doing it well. We are not safe today. And now, our perimeter is growing. We're adding native cloud. We're putting edge computing capabilities in towers and on rooftops. What if someone breaks in using the information they accessed on the rooftop? This makes us vulnerable. So, we are trying to bring our IT and security and development people together and acquire new tools from Red Hat and IBM to do this correctly."

› **Enhanced efficiency for security professionals.** Core platform features of RHEL and OpenShift combined with IBM Cloud Pak for Security help security professionals automate processes, conduct tasks more easily with a better UX, and streamline monitoring across the hybrid multicloud environment. Teams save time for monitoring, detection, remediation, and reporting, while they detect risks faster and accelerate remediation.

"We're working to make our system faster, simpler, and cheaper. We are reducing support tickets by 2%, but the most important thing is velocity and simplification rather than efficiency."

Chief technology officer, multinational telco

"Offering our platform built on Red Hat Enterprise Linux is an important part of the value proposition because it makes the environment more secure."

Product manager of cloud platforms, multinational telco

"Our telco product must be absolutely secure and perform at all times. Every data set, every call, every video must be treated as mission-critical. We can't allow degradation or breaches, so we need to design our systems right."

Head of IT operations, global secure communications and payments company

"I don't see any risks to our investment in Red Hat. If anything, it's the opposite. It de-risks us. And with IBM backing them, it makes that choice even clearer."

Product manager, telco equipment and services

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› **Enhanced efficiency for data teams.** IBM Cloud Pak for Data on RHEL and OpenShift helped businesses capture, integrate, analyze, and report on disparate data sources much faster than ever before. A recent Total Economic Impact study of IBM Cloud Pak for Data found savings equivalent to several data engineers and scientists per organization.[7]

› **Reduced support labor.** Developers and IT professionals had less need to reach out to support teams with task automation, governance, issue monitoring, and a better UX. Higher performance and availability with accelerated release cycles boosts experience for employee and customer end users and reduces their need to contact support.

› **Diminished business risk.** By not modernizing, organizations risk having legacy applications that are no longer supported or would be challenging to use. These legacy apps also have significant risk of downtime and performance issues. If companies cannot quickly improve offerings, and if apps don't meet current market expectations, then they will quickly fall behind.

› **Improved culture.** Better systems and user experiences can help employees spend less time on frustrating manual tasks and more time on innovation and collaboration, improving EX and fostering a stronger connectedness and sense of purpose in work.

"I am truly excited about IBM Blockchain. When IBM announced it, it took everyone by storm. Many small, white-label companies were doing blockchain, but that required excessive due diligence. With IBM getting in that arena, it became a lot more realistic for large companies and [highly regulated industries]."

Head of IT operations, secure payments and communications

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Flexibility

There are many scenarios in which customers might implement solutions from IBM and Red Hat and later realize additional uses and business opportunities, including:

› **Disaster preparedness.** Running a hybrid multicloud platform on OpenShift provides agility and flexibility to respond to disasters (like the COVID-19 pandemic) as needed, quickly reallocating resources to address issues or unexpected loads. The shift to the cloud from data centers combined with automated monitoring and remediation can help companies do more with less and better manage when normal workflows, procedures, and operations are disrupted.

› **Adopt a broader catalog of middleware and services from IBM, Red Hat, third-party providers, and open source communities.** IBM and Red Hat offered catalogs of regularly updated, containerized versions of middleware and solutions based on open source. The platform also enabled simpler integrations with third-party cloud services and SaaS products via API connectors.

› **Test and deploy new AI, ML, blockchain, and IoT capabilities.** Operating a containerized hybrid multicloud environment opened the door for several interviewed companies to consider building new capabilities using AI services such as IBM Watson and Red Hat Insights, plus other services like IBM Blockchain.

› **Shift infrastructure and back-office technology without disrupting application development.** OpenShift and Cloud Paks provided a consistent management plane and framework for all developers to work within, abstracted from the resources they consume, even when new technologies, infrastructure, or patterns were introduced. This ultimately drove faster transformation and adoption of new technologies.

› **Reduce risk of proprietary technology lock-in.** Basing new development on leading open source components such as Linux, Kubernetes, Knative, and Istio helped organizations develop applications that were not locked into a specific cloud provider, hardware stack, middleware vendor, or professional services provider. Companies significantly lowered the barriers to make major shifts if needed, and they could now more easily update or swap one component without massive redevelopment of a monolithic application.

"We're looking at integrating data, using AI and machine learning for voice recognition, and finding useful insights for us and our customers."

Product manager, telco equipment and services

"Artificial intelligence and machine learning will give us more value out of our infrastructure through predictive analysis and automation. Our infrastructure will get smarter, and we'll have a better understanding of how it's working in real time."

Global operations manager, multinational telco

"Kubernetes was the easiest way to create a new platform with the capabilities our end customers need to put their cloud-native services into production. Avoiding vendor lock-in is very important because our customers need to know they can move to another platform based on Linux and Kubernetes to put them at ease."

Product manager of cloud platforms, multinational telco

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Analysis Of Costs

QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE

Total Costs

| COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Technology	$0	$20,356,050	$30,830,407	$41,932,920	$51,669,833	$52,858,328	$143,602,052
Professional services for transformation	$16,500,000	$16,500,000	$16,500,000	$5,500,000	$0	$0	$49,268,595
Professional services for management and support	$0	$5,500,000	$5,500,000	$5,500,000	$5,500,000	$5,500,000	$20,849,327
Training	$21,243,200	$5,254,656	$5,147,472	$5,042,840	$4,938,208	$4,938,208	$40,502,131
Total costs	$37,743,200	$47,610,706	$57,977,879	$57,975,760	$62,108,041	$63,296,536	$254,222,105

Technology

Cloud migration and container platform implementation require significant investments in cloud usage fees and subscriptions for the platform and software services.

› Data center apps are migrated to IBM Cloud alongside new development, incurring usage-based cloud costs. These costs are offset by savings from data center refreshes and operations along with improved utilization, scalability, and streamlined processes.

› The *sample telco* incurs subscription costs for RHEL, Red Hat OpenShift, and IBM Cloud Paks for Applications, Data, and Multicloud Management. It may incur additional costs for services including Red Hat Virtualization, Gluster Storage, and Ansible or IBM WebSphere Liberty, DB2, or MQ.

› Cloud models improved cash flow by moving to monthly subscriptions and usage fees, rather than upfront license purchases.

The IBM and Red Hat platform is also rolled out to the on-premises environment, replacing alternative third-party operating systems, virtualization, platforms, and management tools — with interviewees citing an approximate breakeven or slight decrease in cost as a result. Server platform costs have therefore been excluded from both benefits and costs sections for simplicity as they would not impact the ROI.

Cloud and platform costs grow over time as all non-critical applications are moved to the cloud over a four-year period, but costs are offset by technology savings modeled above. Estimated hardware, cloud, subscription, and licensing costs will vary significantly based on actual usage, bulk discounts, and specific technologies used.

$144 million five-year cost PV — 57%
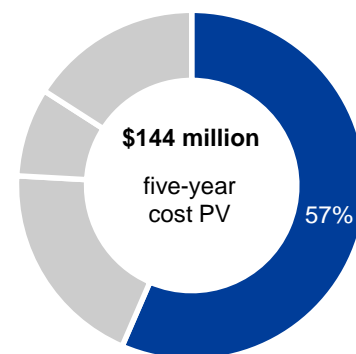
Technology: 57% of total costs

> "There is a saying: 'No one gets fired for hiring IBM.' Now that applies to Red Hat, too. You have that many more options and capabilities at an even lower risk. We have great trust in [Red Hat]."
>
> *Product manager, telco equipment and services*

Technology: Calculation Table

| NUMBER OF CLOUD APPS	CLOUD/PLATFORM COST PER APP	RISK ADJUSTMENT
95 increasing to 225 *(adjusted to reflect resource savings from benefit section)*	$195,000 to $214,000	Moderate (10%)

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Professional Services

Organizations turned to professional services from IBM and Red Hat to determine strategy, test, deploy, and support their modernization efforts. These services could be one-time or recurring, and they often carried significant costs in the millions. However, organizations felt these services were essential. They helped companies figure out where to start, avoid major missteps, implement quickly, and ensure the environments run appropriately.

Forrester interviewed telecommunications organizations with experience partnering with IBM Services for large-scale strategy, design, implementation, and deployment of the new environment's hardware, cloud migration, and container platform. The companies also utilized IBM and Red Hat services for ongoing support and expertise.

Forrester's model for the *sample telco* assumes usage of IBM Services without differentiation for specific line items. Total budget is estimated at $50 million for the deployment over a three-year period, plus $5 million per year in ongoing support and management. These estimates are based on the high end of customer experiences from this and other related studies to ensure conservatism in the model. Actual professional services costs for customers will vary substantially based on the legacy environment, transformation goals, and selected solutions. A moderate risk adjustment of 10% is included, as telco transformation can be particularly complex, leading to possible overages.

Readers should note that internal labor was also crucial throughout the process from IT administrators, developers, and cross-functional leadership. The *sample telco* is assumed to have transformation work completed using a portion of approximately 200 employees' time. However, this work resulted in a net reduction rather than an increase in FTEs for the IT and operations teams, even with the significant time dedicated to this effort. As this model shows a reduction in FTEs, with their employment costs already incurred by default, the value of their internal labor is not added as a line item to this ROI analysis to avoid double-counting.

$70 million
five-year
cost PV

8%

19%
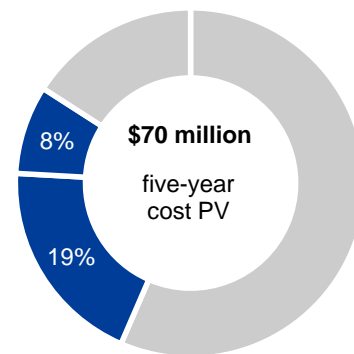
Professional services: **28%** of total costs

"IBM has extraordinary professionals. The people in Red Hat are great. I'm fully convinced that they will be successful, and we are so proud to be working with them. It's an opportunity for us to improve and be better."

Chief technology officer, multinational telco

Professional Services: Calculation Table

| PLANNING, DEPLOYMENT, IMPLEMENTATION	ANNUAL MANAGEMENT AND SUPPORT	RISK ADJUSTMENT
$50 million over three years	$5 million per year	Moderate (10%)

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Training

Employees must be trained to use and take advantage of the new platform, architecture, and DevOps practices. Various roles including developers and infrastructure, platform, and middleware administrators will need to learn to use IBM Cloud, RHEL, Red Hat OpenShift, and IBM Cloud Paks along with other selected services such as Red Hat Virtualization, Ansible, and JBoss EAP or IBM WebSphere Liberty, DB2, and MQ.

These employees must learn to leverage these solutions as a consistent platform across the company's hybrid multicloud environment to ensure optimal resource utilization, performance, and dependability. They will need to understand best practices with microservices and modern architectures, including underpinning open source technologies such as containerization (Kubernetes), serverless (Knative), and service mesh (Istio). They will also need to learn the various prepackaged containers available to them in the catalogs from IBM and Red Hat, to decide which technologies to use where and to find opportunities for innovation.

Forrester's analysis for the *sample telco* includes four weeks of initial training for its 400 IT and operations administrators and 1,500 developers, followed by one week of continuing learning per year thereafter.

Forrester levied a moderate 10% risk adjustment as costs will depend upon on the number of employees, prior architectures and existing knowledge, the specific technologies and scale of implementation, and average regional salaries.

16%

$41 million

five-year
cost PV
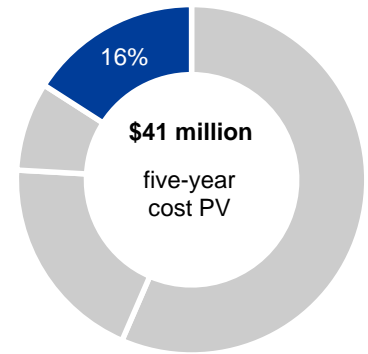
Training:
16% of total costs

| Training: Calculation Table						
IT/OPS FTEs	IT/OPS SALARY	DEVELOPER FTEs	DEVELOPER SALARY	INITIAL TRAINING	CONTINUING TRAINING	RISK ADJUSTMENT
400	$58 per hour	1,500	$65 per hour	160 hours	40 hours per year	Moderate (10%)

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Financial Summary

CONSOLIDATED FIVE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)

Legend:
- Total costs
- Total benefits
- Cumulative net benefits
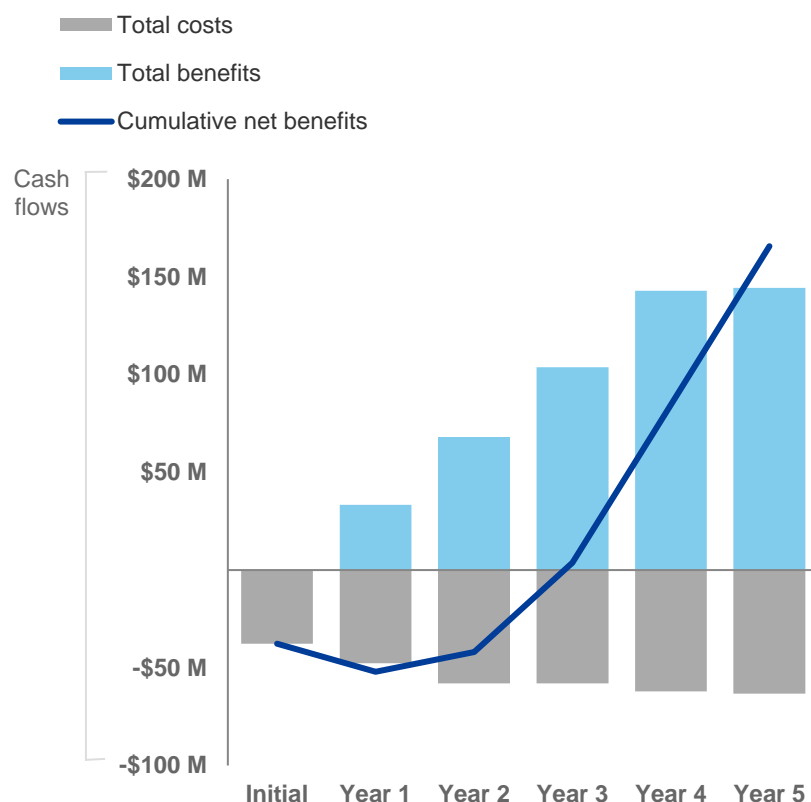
The financial results and risk-adjustment factors calculated in the Benefits and Costs sections are used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Total costs	($37,743,200)	($47,610,706)	($57,977,879)	($57,975,760)	($62,108,041)	($63,296,536)	($254,222,105)
Total benefits	$0	$33,318,518	$68,020,088	$103,745,171	$142,933,701	$144,371,706	$351,718,905
Net benefits	($37,743,200)	($14,292,188)	$10,042,209	$45,769,411	$80,825,661	$81,075,170	$97,496,800
ROI							38%
Payback period							36 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.

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Appendix B: Supplemental Material

Forrester referenced data from the following research and studies in formulating this analysis:

› "Emerging Technology Assessment: The Total Economic Impact™ Of Using Both IBM And Red Hat Solutions Together," a commissioned study conducted by Forrester Consulting on behalf of IBM, June 2019.

› "Emerging Technology Projection: The Total Economic Impact™ Of IBM Blockchain," a commissioned study conducted by Forrester Consulting on behalf of IBM, July 2018.

› "The Real Costs Of Unplanned Downtime," Forrester Consulting, Inc., August 2019.

› "The Total Economic Impact™ Of IBM Cloud For VMWare Solutions," a commissioned study conducted by Forrester Consulting on behalf of IBM, September 2019.

› "The Total Economic Impact™ Of IBM Cloud Pak For Data," a commissioned study conducted by Forrester Consulting on behalf of IBM, February 2020.

› "The Total Economic Impact™ Of IBM Cloud Private," a commissioned study conducted by Forrester Consulting on behalf of IBM, March 2019.

› "The Total Economic Impact™ Of IBM Cloud Global Technology Services," a commissioned study conducted by Forrester Consulting on behalf of IBM.

› "The Total Economic Impact™ Of IBM Design Thinking," a commissioned study conducted by Forrester Consulting on behalf of IBM, February 2018.

› "The Total Economic Impact™ Of IBM Multivendor Support Services," a commissioned study conducted by Forrester Consulting on behalf of IBM, January 2019.

› "The Total Economic Impact™ Of IBM Power Systems For S4HANA," a commissioned study conducted by Forrester Consulting on behalf of IBM, July 2019.

› "The Total Economic Impact™ Of IBM Services For Application Migration And Modernization To A Hybrid Multicloud Environment," a commissioned study conducted by Forrester Consulting on behalf of IBM, September 2019.

› "The Total Economic Impact™ Of IBM Watson Studio And Watson Knowledge Catalog," a commissioned study conducted by Forrester Consulting on behalf of IBM, July 2018.

› "The Total Economic Impact™ Of IBM WebSphere Liberty," a commissioned study conducted by Forrester Consulting on behalf of IBM, September 2018.

› "The Total Economic Impact™ Of Red Hat Ansible Tower," a commissioned study conducted by Forrester Consulting on behalf of Red Hat, June 2018.

› "The Total Economic Impact™ Of Red Hat Consulting's Container Adoption Program And Red Hat Open Innovation Labs," a commissioned study conducted by Forrester Consulting on behalf of Red Hat, June 2018.

› "The Total Economic Impact™ Of Red Hat OpenShift Dedicated," a commissioned study conducted by Forrester Consulting on behalf of Red Hat, June 2019.

› "The Total Economic Impact™ Of Red Hat Virtualization," a commissioned study conducted by Forrester Consulting on behalf of Red Hat, July 2019.

› "Unlock Open Source Technology's Full Value," Forrester Consulting, Inc., October 2019.

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Appendix C: Endnotes

[1] Source: "Quantifying Coronavirus (COVID-19) For The Technology Channel," Forrester Research, Inc., March 24, 2020.

[2] Source: "COVID-19 — Vendors Step Up To Help IT Manage Increased Digital Loads," Forrester Research, Inc., April 1, 2020.

[3] Source: "Now Is A Counterintuitive But Ideal Time To Drive A Companywide Innovation Campaign," Forrester Research, Inc., March 25, 2020.

[4] Source: "Agile, DevOps, And COVID-19," Forrester Research, Inc., March 23, 2020.

[5] Source: "The Real Costs Of Unplanned Downtime," Forrester Consulting, Inc., August 2019.

[6] Source: "Enterprise Security Vendors Need An Infusion Of Open Source Culture," Forrester Research, Inc., November 21, 2019.

[7] Source: "The Total Economic Impact™ Of IBM Cloud Pak For Data," a commissioned study conducted by Forrester Consulting on behalf of IBM, February 2020.

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