

A Forrester Total Economic Impact™
Study Commissioned By IBM
June 2020

The Total Economic Impact™ Of IBM And Red Hat For Financial Services

How Customers Unlocked Business Value
With IBM And Red Hat

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Key Benefits Of Using IBM And Red Hat Solutions Together



Technology savings and optimization:
\$127 million



Workforce efficiency:
\$69 million



Business growth:
\$39 million



Enhanced dependability, security, and compliance:
\$17 million

Executive Summary

Rapid change is de facto in financial services, as both massive incumbents and digital-first entrants face tremendous pressure from customers, competitors, employees, shareholders, and regulators.

Financial services customer expectations are not only set by innovative competitors, but by groundbreaking consumer experiences in all sectors. Generational change amplifies shifting market dynamics as customers in both B2B and B2C increasingly expect top-notch, digital-first experiences in everything from transactions to billing to investments. Companies must meet new technological demands such as mobile payments and 5G and accommodate shifting behaviors against the backdrop of an increasingly complex and interconnected world economy. Further, heavy competition and commoditization plus imported expectations from other sectors have forced down margins (some to zero) as customers shop by price and seek self-service.

Meanwhile, regulators demand that financial services companies meet stringent security and compliance requirements — and both customers and ecosystem partners demand the same. Shareholders simultaneously seek higher returns despite the low-growth environment, forcing cost-cutting. And employees bear the brunt. Tasked to innovate while meeting stringent requirements and cutting costs, they themselves also are increasingly transient and demanding better employee experience (EX).

Challenges don't stop there. From the COVID-19 pandemic and natural disasters influenced by climate change to geopolitical restrictions and societal unrest, financial services companies face large and unpredictable risks. Workforces and technologies must be agile enough to adapt on a moment's notice to ensure business continuity, security, and compliance while also innovating to meet these unexpected challenges. If they fail, financial services companies may lose brand loyalty and revenue, face hefty fines, and incur significant resolution costs.

Winning in this landscape is no small feat, and customer experience (CX) is at the core. Financial services companies must first face their convoluted, fragmented legacy environments and find ways to modernize them successfully. This will allow companies to optimize their workforce efficiency, to work with greater speed and agility, and to take advantage of new technologies. Modernization will also allow companies to monitor, protect, and report on their security and compliance with confidence, while identifying opportunities to cut costs and optimize resources.

Financial services companies must leverage modern agility to quickly develop and release product enhancements and to deploy new tech such as AI, internet of things (IoT), and blockchain — making CX and EX more fluid, secure, data-rich, intelligent, and dependable. Ultimately, better CX drives revenue while operational efficiency boosts margins.

Financial services firms must innovate to win and retain customers while simultaneously cutting operating costs and navigating stringent and complex technical, security, and regulatory requirements.

"We were looking for a platform that would be highly scalable, resilient, and future-proof. We didn't want to buy something and have to go back to the board five years later."

Chief technology and operations officer, APAC national bank



"I look at four dimensions for any key technology decision. The first is strategic partnership. 'Will you compete or partner with me?' The second is market share leadership. 'Who is dominant today?' The third is long-term prospects. 'Who is best-positioned to win in the long run based on strategy, pipeline, and investment stream?' And the final dimension is value. 'Which solutions can give me the best ROI?' And, on those fronts, I love IBM and Red Hat."

VP, financial services



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 financial services industry. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of the 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 five financial services companies.
- › **Eighteen Forrester TEI studies with over 60 interviewed customers** published between 2018 to 2020 examining specific IBM or Red Hat solutions, including 17 financial services firms.
- › **Annual reports and financial disclosures** for leading publicly traded companies in financial services 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 bank* experienced 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 bank* earns \$5 billion in annual revenue, employs 10,000 FTE including 100 in IT and 350 developers, and maintains 240 apps across two data centers with 3,840 virtual machines (VMs). It conducts a three-year technology transformation in which it: 1) replaces legacy servers with IBM Z systems for mission-critical apps; 2) migrates other on-premises workloads to IBM cloud; 3) deploys a hybrid multicloud container platform based on Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks across IBM Z, IBM Cloud, and a third-party public cloud; 4) modernizes existing applications; and 5) leverages containerized services to drive innovation.

Key Findings

Interviewed financial services companies shared their challenges and goals with Forrester and described how they turned to IBM and Red Hat to shore up, modernize, and propel their businesses in the future. Customers reported that IBM and Red Hat helped them strategize and successfully modernize complex legacy environments. Using IBM and Red Hat solutions together, these interviewed companies reduced IT expenditures via cloud migration and platform optimization, while gaining greater flexibility and control over infrastructure. Developers and IT teams benefited from improved user experience, consolidated tools, automated processes, and streamlined workflows. Customers also bolstered security, compliance, and dependability, while enabling development teams to release faster and innovate with new technologies — improving customer experience and driving business growth.



ROI
42%



Benefits PV
\$252 million



NPV
\$75 million



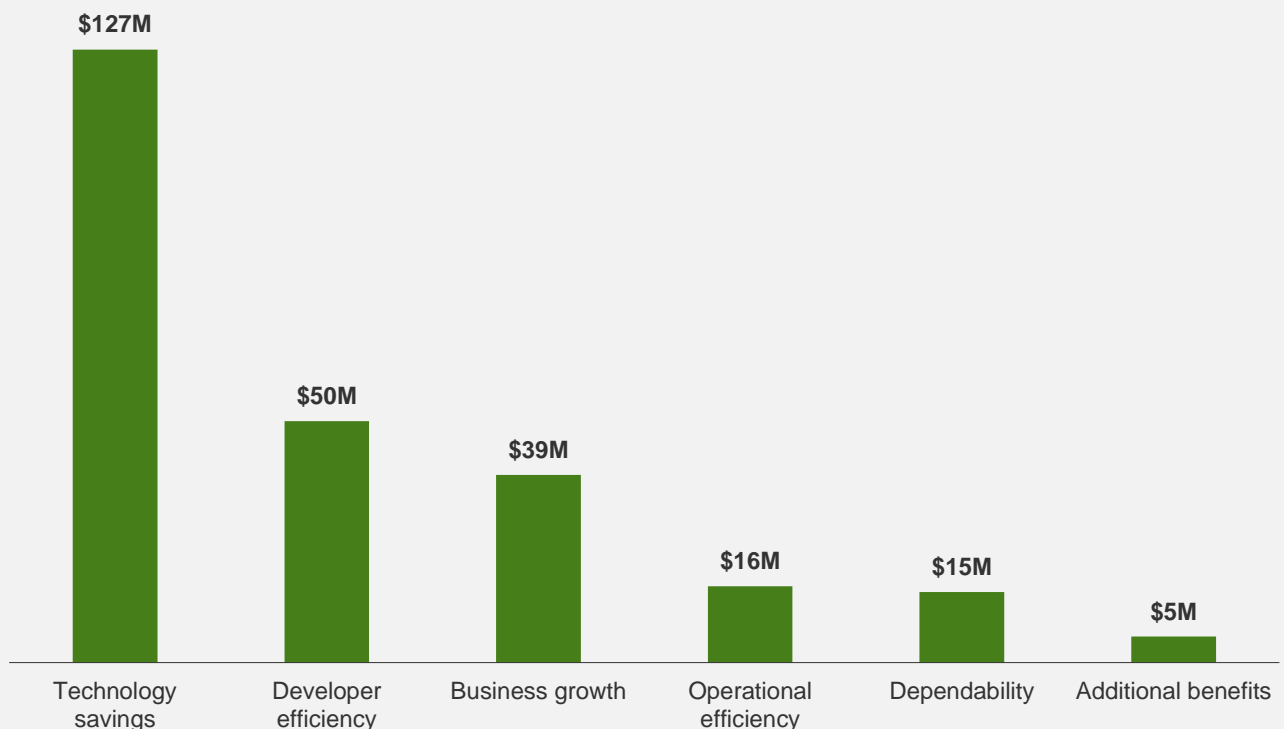
Payback
29 months

Synopsis. Forrester's financial analysis found that the *sample bank* experiences incremental benefits of \$252 million over five years versus incremental costs of \$177 million by modernizing with a hybrid multicloud platform using IBM and Red Hat, adding up to a net present value (NPV) of \$75 million, a payback period of 29 months, and an ROI of 42%.

Quantified benefits. Forrester modeled total benefits of \$252 million over five years for the *sample bank*, including:

- › Boosts revenue by \$128 million, capturing \$39 million in net income with improved CX and new applications.
- › Improves productivity for 350 developers, recapturing \$50 million.
- › Saves \$26 million by replacing legacy hardware with IBM Z systems for mission-critical applications and data and saves \$35 million by migrating all other workloads to IBM Cloud.
- › Optimizes cloud spend by \$20 million with platform efficiencies from Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks. Reduces resource costs by \$12 million by modernizing apps and prevents \$15 million in excess spending for over-provisioning.
- › Decreases software license costs by \$17 million with the IBM and Red Hat platform combined with app modernization and reduces risk of hardware, cloud, and software lock-in by \$2 million.
- › Reallocates 60 IT and operations administrators, saving \$16 million.
- › Enhances dependability, avoiding \$15 million in costs of downtime.
- › Achieves \$5 million in additional benefits from better hiring and retention, strengthened security, and improved compliance.

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



"IBM and Red Hat are playing an important back-office role for cost, security, innovation, and streamlining of operations — today and in the future."

VP and information security officer, NA regional bank



"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



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 fraud reduction and disaster preparedness. IBM and Red Hat enhanced employee efficiency for data, security, and support teams, improving EX and culture along the way.

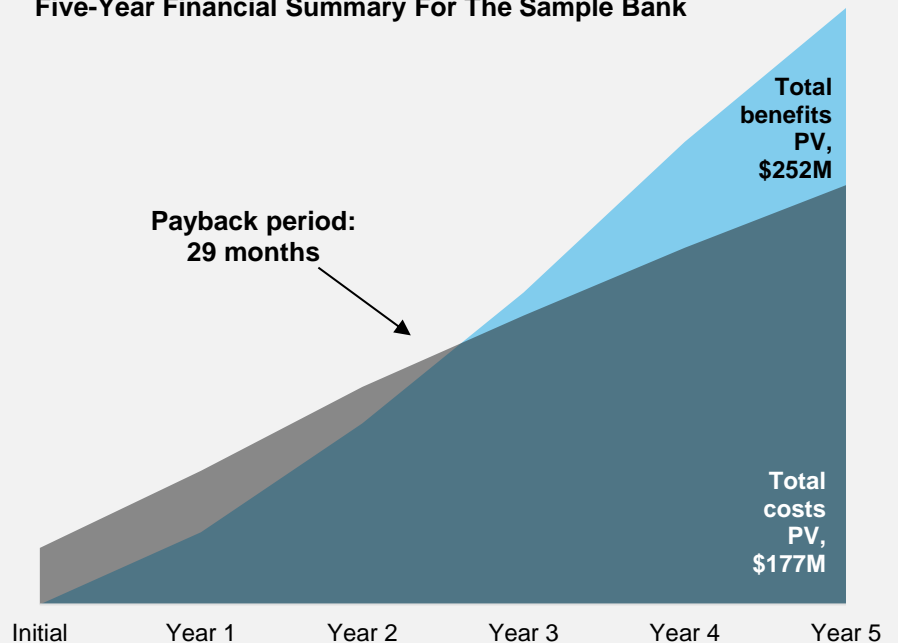
Flexibility. Customers gained flexibility and agility to respond to disasters to ensure business continuity, do more with less, and adapt with fast resource reallocation and innovation. They gained future opportunities to innovate by leveraging the broad catalogs of IBM and Red Hat services and by testing new AI, machine learning (ML), blockchain, and 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 \$177 million over five years for the composite organization, including:

- › Technology costs of \$101 million for hardware, cloud, and software.
- › Professional services costs of \$47 million for transformation and \$20 million for ongoing management and support.
- › IT and developer training hours valued at \$9 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.

Five-Year Financial Summary For The Sample Bank



Forrester's TEI methodology helps organizations understand, evaluate, and communicate the business impact of any investment.

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.

Market Trends

FINANCIAL SERVICES ENTERS THE NEW DECADE

Industry Trends

Rising competition from low-cost, digital-first market entrants is pushing longstanding financial services companies to the brink. They must heed the call to modernize both their user-facing and back-office technology as they face increased competition and rising customer expectations.

- › **Consumers expect top-notch experiences at low prices and are less loyal than ever.** For B2C markets, consumers increasingly favor mobile and online banking over brick-and-mortar retail banking due to higher interest rates, lower fees, reduced friction, and better CX. Millennials are turning to no-commission, app-based trading and zero-fee/low-fee index funds rather than trusted financial advisors and managed funds. Consumers of all generations now see mobile apps and increasingly mobile or contactless payments as a must — making payments, setting up automated billing, viewing transaction history, and reaching out to customer support all at their fingertips.
- › **Generational change and consumer innovation are forcing change in B2B.** Millennials have firmly joined Generation X in their responsibility for business buying decisions, while approximately half of Baby Boomers are already retired.¹ This generational shift means consumer preferences now inform B2B buying decisions, and these new B2B buyers have vastly different expectations and behaviors than those in decades past. Today's buyers demand choice and flexibility for everything from payment processing to employee fund selections, and they desire the same level of fast, digital-first experiences they enjoy in the consumer world. This trend also impacts the changing workforce, which comes with new expectations and needs.
- › **The back office must change to meet market demands, growing complexity, and shifting behaviors.** From independent contractors to local food trucks to the Fortune 500 companies, every business must not only accommodate digital payments, but lead with them. This requires significant financial services infrastructure and flexibility to move and track money quickly, securely, and with great CX. And along the way, teams are being asked to do more with less.

Meanwhile, technical debt looms for financial services companies. Any application change, update, or move must be done with an abundance of caution and testing to guarantee no adverse impact. Technical expertise for these aging technologies is increasingly hard to find, as trained experts leave the workforce and new entrants turn to newer programming languages and tools. Stringent security, compliance, availability, and performance needs add further complication.

- › **Companies must guarantee performance and high availability.** Mission-critical financial services apps demand the highest service levels and the lowest possible latency. A failed or delayed transaction can easily cost millions to the company or its customers. Poor performance, excess downtime, or code errors can all lead to operational costs, fines, and lost sales.
- › **Companies must guarantee security and compliance.** Sensitive data such as personally identifiable information (PII) and transactions must be protected to care for customers and business interests. No industry's data offers more appeal to bad actors as does financial services' direct access to financial data. Government regulations also vary substantially with stringent (and often changing) regional requirements for reporting, data sovereignty, and remediation processes — with increasingly expensive noncompliance fines.

Ambitious product, IT, and DevOps teams with a vision for modernization and innovation sometimes find their efforts stunted by burdensome and dated regulatory rules, outdated tech platforms, and internal business leaders fixated on challenges rather than opportunities.

But innovation in today's market is not a choice. It's an imperative. So how do companies cut costs while meeting these requirements? How do they attract, win, and retain customers? How do they ensure a happy and effective workforce? And how do they ensure continuity and agility?

Modernization

Leading financial services companies turn to cloud platforms and services, application modernization techniques, and emerging technologies to innovate even in the face of such a complex landscape.

- › **Cloud is key to infrastructure modernization, and hybrid is the new cloud reality.** Tech leaders, operations teams, and developers must be able to quickly and effectively work across many cloud environments to drive innovation when and where it's needed. Financial services companies are turning to the cloud to improve customer-facing apps, accelerate and streamline app development, and scale apps on demand. However, many critical applications and much data remain on premises with little sign of change because companies avoid new regulatory compliance risks and are comfortable with on-premises IT dependability and security. Facing large internal and external hurdles to moving these systems to the cloud, many financial services companies are instead focusing on modernizing in place. They're bringing the functionality and benefits of the cloud to the data center instead of trying to migrate the entire data center to the cloud.
- › **Application modernization demands powerful open source platforms and emerging technology innovations.** Companies must first bring apps to modern cloud and on-premises platforms rich with innovative services, then rearchitect them using containers and microservices to enable rapid change and testing. Blockchain, AI, and edge computing offer opportunities to make app experiences more fluid, secure, data-rich, intelligent, and dependable. Emerging technologies also aid back-office app modernization with automation, monitoring, and management to optimize resource utilization and IT costs, prevent wasted labor, detect and remediate issues, and trace and report on data flowing through the financial ecosystem.

"We are focused on three key strategic value areas: exceptional client experience, operational excellence, and industry-leading security."

VP, financial services



"We need to stay alive. If you don't have an online service or a mobile app, you don't exist."

VP and information security officer, NA regional bank



Financial services firms must innovate to win and retain customers while simultaneously cutting operating costs and navigating stringent and complex technical, security, and regulatory requirements.



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.² 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.³

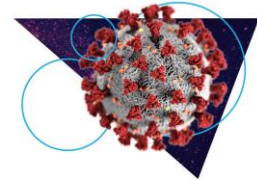
Financial services companies must remain stoic during these difficult times, ensuring consistent operations with trust and ease. Necessitated branch closures will cause disruption while changing behaviors such as increased favor for contactless payments over cash and increased market volatility will pressure systems.⁴ Financial services companies will also need to help their customers get refunds from other companies and manage disputes, further burdening support desks and software.⁵

They will need to launch new informative websites and new capabilities to support new programs such as small-business loans, while adjusting applications and automation to accommodate more lenient policies around late payments or account balances or mandated changes such as a pause on evictions and foreclosures.⁶ Information needs to be clear, accessible, and work seamlessly — projecting trust and support as B2B and B2C customers navigate stressful, uncharted waters.⁷

While fees and reputation will both remain important for consumers choosing a bank or investment account, reputation will be increasingly important in a bear market. For example, investors impacted by a recent one-day investment app failure were exposed to significant losses and missed opportunities and they may now look to more trusted brands.⁸

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.⁹ 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.¹⁰
- › 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.

Yet, there may be no better time to creatively solve customers' problems and stake claim as an innovation leader and driver of change.

Customer Journey

CUSTOMERS' DRIVERS FOR IBM AND RED HAT INVESTMENTS

Interviewed Organizations

Forrester interviewed five financial services companies that are customers of both IBM and Red Hat to learn about their experiences utilizing solutions from both companies in tandem.

- › Interviewed companies employ between 500 and 100,000 FTEs with an average of 15,000 FTEs and a median of 1,000 FTEs.
- › Three interviewed companies are national or regional banks, one company manages mutual funds and pensions, and another company provides secure payment, transaction, and communication services.
- › Two interviewed companies are based in North America, two are in Europe, and one is in Asia.

Forrester has also integrated data from the following sources:

- › Ten customer interviews with transportation and telecommunications 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 17 from the financial services industry.
- › Annual reports and financial disclosures for leading publicly traded companies in financial services and two other sectors.
- › Forrester's comprehensive market research.

Key Challenges

Interviewed companies faced common pressures from legacy infrastructure, strict compliance and security demands, poor software experiences, and rising marketplace competition,

- › **Legacy performance and availability fell short.** The Asian bank's chief technology and operations officer explained: "We were changing into a more customer-centric business model. In order to do that, we had to have better service, availability, resiliency, and security along with data and analytics to more deeply understand our customers."
- › **Market pressures necessitated digital innovation.** The North American regional bank's VP and information security officer said: "Banks like ours all face a predicament: We need to undergo digital transformation to compete, stay alive, and stay relevant. If you do not have a mobile presence, you're not going to win customers even if you have tens or hundreds of branches. We needed to have a mobile presence, and Red Hat gave use the easiest path."
- › **Talent pools lacked experience with legacy architectures.** Legacy applications and infrastructure often required niche skill sets, making it difficult to find the needed specialists — which was risky for firms. They needed these experts to ensure mission-critical operations.

Interviewed financial services customers used a range of the following solutions:

IBM

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

Red Hat

Ansible
Consulting
Container Adoption Program
Enterprise Linux (RHEL)
Gluster Storage
Insights
JBoss EAP
JBoss Web Server
Open Innovation Labs
OpenShift
OpenStack Platform
Satellite
Virtualization

Partner Selection

The interviewed organizations searched for partners that could:

- › **Combine the value of the data center and the cloud to drive innovation.** The North American regional bank used Red Hat Enterprise Linux (RHEL) and OpenShift on its mainframes, gaining cloud-like functionality within its data center. The VP and information security officer said: “They keep saying that mainframes will die. That conversation has been happening for decades. But it’s not true. Mainframe is not going to die. That’s not to say that the cloud and software-as-a-service (SaaS) aren’t important, because they are. What’s really happening here is that Red Hat brings the value of the cloud and of SaaS to the mainframe for today’s workloads.”
- › **Deliver dependability, security, and compliance with hardware, software, and professional services.** The head of IT operations for a secure payments and communications explained: “IBM and Red Hat are the titans. IBM offers brand recognition and gravitas for our company. . . . 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 chose a vendor, they didn’t even offer any other alternatives. Red Hat was the hands-down choice.”
- › **Enable successful modernization with industry and technical expertise.** Financial services firms were plagued by technical debt, legacy infrastructure, and strict compliance rules. Interviewees desired partners that understood these complex challenges, modernizing applications and deploying new technologies undeterred.

“I look at four dimensions for any key technology decision. The first is strategic partnership. ‘Will you compete or partner with me?’ The second is market share leadership. ‘Who is dominant today?’ The third is long-term prospects. ‘Who is best positioned to win in the long run based on strategy, pipeline, and investment stream?’ And the final dimension is value. ‘Which solutions can give me the best ROI?’ And, on those fronts, I love IBM and Red Hat.”

VP, financial services



IBM And Red Hat Capabilities

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

- › **Professional services.** IBM Services, IBM Garage, Red Hat Container Adoption Program, and others helped set strategy and taught companies to leverage modern containerization, microservices, and serverless architectures despite technical debt and stringent security and compliance needs.
- › **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.
- › **Platform.** Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks provided the technology to consistently develop, monitor, and manage modern and legacy applications across hybrid and multicloud infrastructures (both IBM and third-party).
- › **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.

“IBM and Red Hat are the titans. IBM offers brand recognition and gravitas for our company . . . 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 chose 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



Financial Services Model

Composite Organization

To model the Total Economic Impact of investing in solutions from IBM and Red Hat for a financial services company, Forrester aggregated findings to design a “composite organization” referred to as *sample bank* and an associated ROI analysis that is representative of the five interviewed financial services customers.

The *sample bank* is a North American-based bank that:

- › Employs 10,000 FTEs.
- › Earns \$5 billion in revenue per year with a 30.5% net profit margin.
- › Runs 80 mission-critical apps and 160 customer-facing and noncritical apps in two regional data centers with 60 racks and 1,920 VMs each.
- › Runs 40 customer-facing apps out of a third-party public cloud.
- › Employs 100 FTEs in IT and operations, earning an average fully burdened annual salary of \$120,000
- › Employs 350 FTEs in development, earning an average fully burdened annual salary of \$135,000.

Modeled Deployment

The *sample bank* conducts a three-year technology transformation (with a five-year economic analysis) including data center redesign, cloud migration, and application modernization. The *sample bank*:

- › Partners with **IBM Services** to: 1) strategize, plan, and conduct its data center transformation; 2) support adoption of IBM Cloud; 3) implement Red Hat Enterprise Linux, 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.
- › Utilizes the **Red Hat Container Adoption Program** to teach DevOps teams to use containers and microservices to their potential, helping modernize existing applications and develop new ones.
- › Engages **IBM Garage** for ideation and design of new apps leveraging AI, blockchain, and Edge capabilities from IBM, Red Hat, and the open source marketplace.
- › Modernizes two regional data centers for mission-critical apps and data, replacing 40 legacy server racks with six **IBM Z systems**.
- › Decommissions 80 server racks over a four-year period, moving 25% of the 160 apps run using the infrastructure to **IBM Cloud** each year.
- › Deploys **Red Hat Enterprise Linux** 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 modern and legacy data centers, its IBM Cloud environment, and a third-party public cloud environment.

Financial modeling is based on customer data. Modeled impacts are shown for the most common, consistent solution combinations shared by interviewed customers.

Benefit and summary sections summarize all important elements for the calculation, but omit the full tables to avoid excessive length. Calculation tables will be available upon request.

Analysis Of Benefits

QUANTIFIED BENEFIT DATA AS APPLIED TO THE COMPOSITE

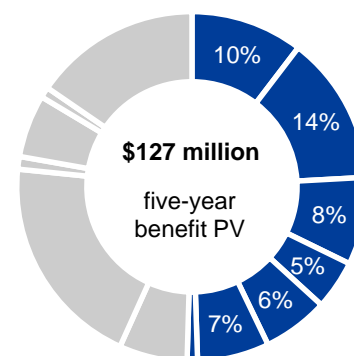
Total Benefits						
BENEFIT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Technology savings: modernize data center hardware	\$6,912,000	\$6,912,000	\$6,912,000	\$6,912,000	\$6,912,000	\$26,201,918
Technology savings: decommission data centers with cloud migration	\$3,456,000	\$6,912,000	\$10,368,000	\$13,824,000	\$13,824,000	\$34,669,441
Technology savings: optimize resources with platform management	\$2,808,000	\$4,308,876	\$5,877,302	\$7,515,612	\$7,688,484	\$20,436,694
Technology savings: optimize resources with app modernization	\$421,200	\$1,615,829	\$3,085,583	\$5,636,709	\$5,766,363	\$11,466,955
Technology savings: avoid overprovisioning with cloud scalability	\$2,106,000	\$3,231,657	\$4,407,977	\$5,636,709	\$5,766,363	\$15,327,520
Technology savings: reduce software licensing	\$1,968,538	\$3,160,469	\$4,608,944	\$6,734,146	\$6,888,773	\$16,741,203
Technology savings: avoid infrastructure lock-in	\$0	\$0	\$207,710	\$961,115	\$2,592,038	\$2,421,961
Operational efficiency	\$1,224,000	\$3,468,000	\$5,202,000	\$6,120,000	\$6,120,000	\$15,867,263
Developer efficiency	\$7,142,720	\$11,739,520	\$15,558,400	\$19,094,400	\$14,851,200	\$50,147,880
Attract, hire, and retain employees	\$644,640	\$815,280	\$815,280	\$815,280	\$815,280	\$2,935,425
Dependability	\$2,736,000	\$3,420,000	\$4,104,000	\$4,788,000	\$4,788,000	\$14,640,355
Security and compliance	\$529,446	\$603,342	\$677,240	\$751,137	\$751,137	\$2,468,198
Business growth	\$3,671,764	\$9,458,486	\$11,945,543	\$14,432,600	\$14,432,600	\$38,948,930
Total benefits (risk-adjusted)	\$33,620,307	\$55,645,458	\$73,769,980	\$93,221,707	\$91,196,237	\$252,273,743

Technology Savings

Benefit summary. Investments in hardware, platform, and application modernization allowed interviewees to eliminate data center operational costs, shrink cloud spend, condense 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 financial services. Although the data center remains crucial for critical financial services data and workloads, IBM Cloud met interviewees' intensive security and compliance requirements that other providers struggled to match. That enabled greater cloud investment and realization of cloud benefits. Meanwhile, IBM Z systems boosted security, dependability, performance, and density, while Red Hat Enterprise Linux and OpenShift plus IBM Cloud Paks brought cloud benefits to IBM Z and other hardware. Spanning the hybrid multicloud environment, the platform enabled containerization, microservices, and adoption of new technologies to optimize costs while gaining portability and scalability to adapt to business changes with ease. Benefits for interviewed financial services customers include:

- **An Asian national bank slashed infrastructure costs by 44% while scaling to meet triple-digit growth.** The company needed to handle two to four times its current traffic, but it had maxed out resources and physical space in its data warehouse. Limited regional cloud availability and security concerns necessitated that the company remain on-premises, so it turned to IBM Z Linux, which offered seven times to 10 times more capacity per server than its legacy equipment. Not only was the company now able to meet business demands, it could do so at a much lower cost (despite higher per-server price) by purchasing fewer servers, reducing power consumption, and avoiding the need to lease additional space.
- **A European financial services company boosted utilization by 20% to 30% and slashed middleware licensing by up to 50% for containerized apps.** It used containers in IBM Cloud Paks on RHEL and OpenShift to find and destroy idle environments, saving \$200,000. The shift to subscription and consumption price improved cash flow. The company aims to save another \$400,000 in costs by containerizing most its remaining legacy apps.
- **A North American regional bank slashed hosting costs and eliminated extract, transform, load (ETL) middleware.** The bank deployed OpenShift on its IBM mainframes, increasing resource utilization enough to move over 50% of third-party, cloud-hosted workloads to OpenShift-managed hardware. That slashed cloud costs without adding servers. Deploying OpenShift across its hybrid environment saved substantial costs of a complex, third-party ETL solution that previously linked its mainframes and public cloud environments. With its newfound, container-driven portability, it could now save costs while also boosting performance.
- **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.



**Technology savings:
50% of total benefits**

"When we were upgrading our hardware, we needed performance and stability. We weren't looking for business savings, but we got them. Our total cost of ownership went down by 44% over a five-year period. Looking back, it's a no-brainer."

Chief technology and operations officer, APAC national bank



"We use a lot less resources now that we are in a private cloud. We found that we were 20% to 30% under our potential utilization, and containers squeezed out that extra hardware capacity."

Chief technical architect, EMEA financial services



Financial model. The *sample bank*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$127 million:

- › **Avoids \$35 million in costs in hardware refreshes and operational costs by migrating workloads to IBM Cloud.** The *sample bank* migrates 80 racks hosting 160 apps over a four-year period, saving \$128,000 in annual operational costs per rack and \$320,000 per refresh at a 5-year refresh cycle.
- › **Modernizes mission-critical legacy servers with higher performing, higher density IBM Z systems at a ratio of three IBM Z systems per 20 legacy server racks.** The *sample bank* saves \$26 million in avoided hardware refreshes and reduced total operational costs for networking, power, cooling, and facilities.
- › **Optimizes cloud costs with platform management, improving density by 20% to save \$20 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.
- › **Trims software license costs by 15% for containerized apps and by 35% for apps refactored with modern architectures, saving \$17 million.** The *sample bank* moves 280 apps from legacy hardware with 4,480 VMs into the Red Hat OpenShift platform across its IBM Z, IBM Cloud, and third-party cloud infrastructure. As a result, it decreases the number of licenses by decreasing servers, VMs, and workload requirements, and by finding and ending idle workloads.
- › **Prevents 15% in excess infrastructure, avoiding \$15 million in potential costs.** The *sample bank* scales cloud resources as needed with usage-based pricing to avoid over-provisioning for peak loads.
- › **Reduces resource requirements by 30% for modernized apps, saving \$12 million.** The *sample bank* refactors and modernizes 100 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.
- › **Diminishes risk of lock-in to rising costs, avoiding \$2 million in modeled cost increases.** The *sample bank* gains workload portability to any on-premises and cloud environment that supports z/OS, Red Hat Enterprise Linux, Red Hat OpenShift, or IBM Cloud Paks. With modeled annual price increases for infrastructure and licenses tied to 2.3% inflation, the *sample bank* 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 bank:

- Migrates workloads from legacy hardware to IBM Cloud, saving \$35M.
- Modernizes mission-critical hardware with IBM Z systems, saving \$26M.
- Optimizes cloud costs with platform management by 20%, saving \$20M.
- Trims software licensing by 15% for containerized apps and by 35% for modernized apps, saving \$17M.
- Prevents excess overhead of 15%, saving \$15M.
- Reduces resource demands for modern apps by 30%, saving \$12M.
- Diminishes risk of lock-in, avoiding \$2M in modeled price increases.

"Running containers on IBM mainframes makes my life so much easier. We're improving utilization — including memory — by 50%. And now, as we develop containers, we do not have to care about the underlying compute, whether it is z/OS on the mainframe or Linux in the cloud."

VP and information security officer, NA regional bank



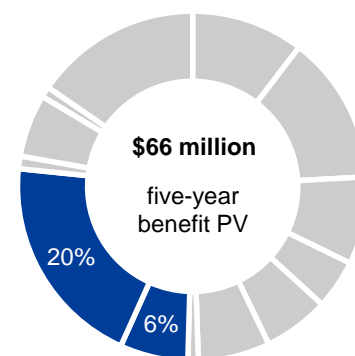
Workforce Efficiency

Benefit summary. Modern app architecture and enabling platforms drive speed and efficiency for IT, operations, and development teams. Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks formed a cohesive platform for development, deployment, monitoring, and management across hybrid multicloud environments. Complexity was abstracted, code was broken down into simpler isolated elements, and integrated services were consumed in prepackaged containers — helping developers to create and maintain apps more quickly 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 financial services. Financial services companies are often straddled with technical debt, legacy hardware, compliance-driven restrictions, and multicloud fragmentation. They want (and need) to modernize and improve efficiency, and a consolidated IBM and Red Hat platform delivered the benefits of cloud and open source with enterprise-grade dependability, security, and compliance. IT and development teams freed themselves of burdensome, complex processes and instead relied on centrally enforced governance with preapproved, prepackaged containers for services. Specialized teams could now more easily share workloads, and employees were freed to work on more enjoyable, value-add work.

Benefits for interviewed financial services customers include:

- › A European financial services company's 200 developers saw extreme savings as those working on containerized applications increased their productivity tenfold. Deployment errors plummeted by 90%, with a nonspecialized developer launching to production in 10 minutes versus over 75 labor hours for a specialized, 15-person — ensuring continuity and avoiding delays.
- › A European financial services reallocated 14 FTEs out of a 15-person team that previously procured, deployed, and managed each individual item of middleware. It could now handle that process via developer self-service with simplified oversight from the team managing IBM Cloud Paks on Red Hat OpenShift. Further, the company slashed labor to resolve major incidents from weeks to only a couple of hours.
- › An Asian national bank reallocated four of its 12 infrastructure administrators (33%) in one data center, even as the company experienced massive business growth. Meanwhile, it saved significant IT labor and accelerated development by slashing the time to set up test environments with IBM Z running Red Hat Enterprise Linux.
- › A North American regional bank broke legacy middleware and coding dependencies that had prevented innovation and customization. The company streamlined internal development and operations, and it improved performance and latency to deliver better user experiences to employees and customers.



Workforce efficiency: 26% of total benefits

"With IBM Z Linux, we set it up, and it just runs. We're not always fussing with it. And since we have fewer machines because of their increased performance, we spend less time physically working on the machines, doing software patches, diagnosing issues, and making updates."

Chief technology and operations officer, APAC financial services



"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



Financial model. The *sample bank*'s investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$66 million.

- › **Reallocates 30% of infrastructure admins for its mission-critical data centers by replacing legacy hardware with IBM Z systems.** The *sample bank* begins with 20 admins (10 per data center), six of which are shifted to other value-add tasks by Year 2.
- › **Reallocates all infrastructure admins for noncritical hardware as it fully migrates the environment to the cloud.** The *sample bank* begins with 30 admins (15 per data center), 25% of which are shifted each year to other value-add tasks with all FTEs reallocated by Year 4.
- › **Reallocates 80% of middleware admins by using prepackaged services from IBM and Red Hat catalogs.** The *sample bank* reallocates 40% of its 20 middleware admins (each specializing in a different technology) in Year 2, and another 40% in Year 3.
- › **Boosts productivity for platform and operations administrators by up to 50%.** The *sample bank* improves efficiency for its 30 admins with streamlined monitoring, management, and automation in a single hybrid multicloud solution with improved UX.
- › **Doubles app development speed, reducing timelines from 24 weeks to 12 weeks.** The *sample bank*'s eight-person teams eliminate environment wait time, streamline service integration with prepackaged containers, and code faster with improved, consolidated UX. Teams ultimately deliver apps with 90% fewer errors which, combined with automated CI/CD, slashes the time needed for testing and deployment.
- › **Decreases annual maintenance labor by 25% for containerized legacy apps.** The *sample bank*'s product teams previously dedicated eight weeks per year to update and maintain applications. With the IBM and Red Hat platform, teams need only six weeks with automation, consolidated tools, prepackaged services, and improved UX.
- › **Halves annual maintenance labor for modernized apps.** Microservices architecture shaves another two weeks per year from app updates and maintenance (down from eight to four weeks), as work can be completed much more easily with fewer dependencies and lower complexity.
- › **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) 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.



The sample bank:

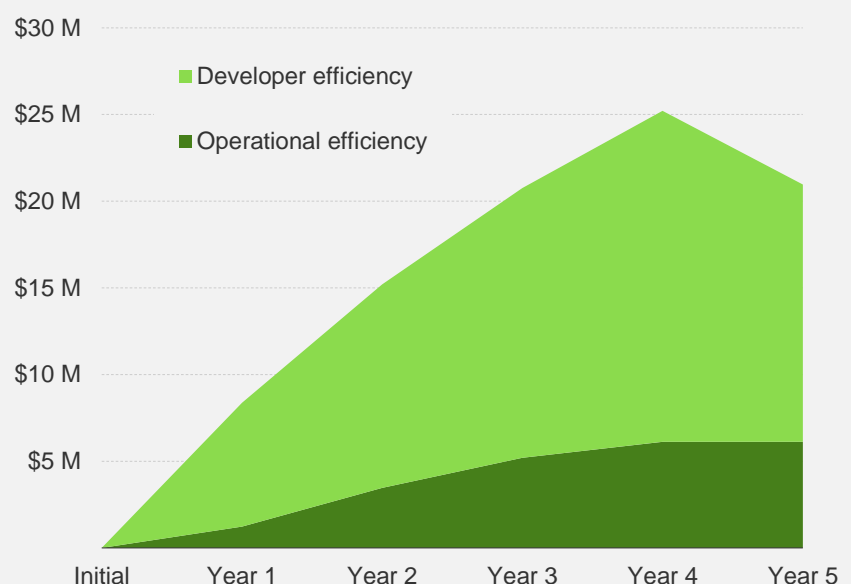
- Boosts productivity for 350 developers, saving \$50M.
- Reallocates 60 IT and operations administrators, saving \$16M.

"We used to need many different specialists to manage each different middleware technology. Now that we've containerized applications with [IBM Cloud Paks], one person checks and launches to pipeline for all our containerized middleware."

Chief technical architect,
EMEA financial services



Annual Labor Savings For The Sample Bank



Hiring And Retention

Benefit summary. Replacing legacy infrastructure and tools with modern ones addressed pressing talent search needs. Organizations previously struggled to find specialists to work on niche, outdated technologies. They could now access a larger workforce with skills in Linux, Kubernetes, Java, or specific IBM and Red Hat solutions. It was also easier to attract, hire, and retain employees due to a better EX when using modern, consolidated solutions.

Impact to financial services. Legacy mainframes pose significant hiring and retention challenges in financial services. The applications and data on the mainframes are the core of the company, from transactions to accounts and beyond. Companies must ensure dependability and security or face massive consequences. Meanwhile, those apps and data are crucial for modernization efforts. Deploying Red Hat Enterprise Linux and OpenShift to mainframes benefited companies by accessing a broader workforce. As the interviewed financial services customers explained:

- › **An Asian national bank struggled to find, hire, and retain talent with the needed skill sets to work on the legacy infrastructure.** By adopting Red Hat Enterprise Linux, it was able to find a new, broader pool of prospective employees that had been trained in college or at previous jobs and enjoyed working with the newer, better system.
- › **A European financial services company strained to maintain a team of middleware specialists.** Few experts existed in local markets for the firm's various middleware technologies. Red Hat OpenShift and IBM Cloud Paks allowed the company to hire IT and development personnel with broader experience — reaching a larger labor pool with lower-cost employees. Employees preferred the new solution and could also now cover for each other, reducing overtime and improving retention on the team.
- › **A North American regional bank couldn't find administrators and developers for its legacy mainframes.** Hiring mainframe experts was difficult and expensive, and the company faced the risk of losing invaluable knowledge if employees left. By adopting Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks, the company tapped into a much broader pool of employees while also improving EX. The VP and information security officer shared: "No developer coming out of college has knowledge or experience with mainframes. They don't know how to do it. So, there is less and less talent in the market, and having Red Hat really helps."

Financial model. The *sample bank's* investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$3 million, reducing hiring costs by 10% and boosting retention by 2%.



The sample bank:

- Boosts IT and developer employee retention by 2%.
- Reduces IT and developer hiring costs by 10%.

"Mainframe developers are very unique. They are hard to find and retain. But with Red Hat technology, we can find new developers while IBM Services fills the technical gaps. We are less dependent on mainframe gurus."

VP and information security officer, NA regional bank



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	2% better	80% increases to 81.6%	Very high (20%)

Dependability

Benefit summary. 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 hardware and IBM Cloud provided high-performance, secure, dependable infrastructure to run applications and store data, while Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks provided platform services to connect infrastructure, data, and apps with consistent monitoring and management in order to catch, fix, and prevent issues to ensure availability, performance, and resiliency. As a result, companies were able to significantly reduce or eliminate user-impacting downtime.

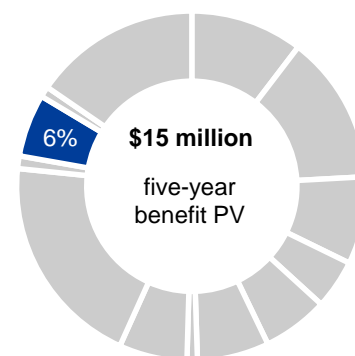
In a recent survey, Forrester found that 85% of companies face unplanned downtime at least every other month — with 41% facing unplanned downtime every month.¹¹ Downtime disrupts business operations and, in turn, causes loss of productivity and revenue. IT leaders indicated that the costliest aspects of downtime are lost revenue (53%), lost productivity (47%), and the negative impact on corporate reputation (41%). With an average of 830 minutes of downtime per year, respondents identified that unplanned downtime costs an average of \$6 million per year in remediation costs, fees, and lost revenues.

Impact to financial services. Financial services companies trusted IBM to understand their industry and provide top-notch hardware, software, and professional services to deliver the dependability they needed. Reliability and performance are especially crucial to ensure instant transactions and access to funds.

For example, an Asian national bank struggled with frequent downtime that previously plagued its environment, resulting in lost revenue, excess resolution costs, and major brand reputation risks. The company eliminated downtime by deploying IBM Z with RHEL, improved batch processing performance by 40%, and slashed disaster recovery times from 4 hours to 10 seconds by automating failover.

Similarly, a North American regional bank improved its “24/7/365” performance by deploying IBM Cloud Paks and Red Hat OpenShift, slashing latency for employee end users and customers alike, which decreased wasted labor and improved CX.

Financial model. The *sample bank*’s investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$15 million, slashing unplanned downtime by 95% within the IBM and Red Hat environment.



Dependability:
6% of total benefits



**The sample bank
reduces downtime by
up to 95%.**

“We can’t let our systems go down. As a financial services company, people might think they’ve been hacked: It’s a huge brand reputation risk.”

*Chief technology and operations
officer, APAC financial services*



Dependability: Calculation Table

ANNUAL COST OF UNPLANNED DOWNTIME	REDUCED DOWNTIME WITH IBM AND RED HAT PLATFORM	PERCENT OF ENVIRONMENT IN IBM AND RED HAT PLATFORM	RISK ADJUSTMENT
\$6 million	95%	57% in Year 1, 71% in Year 2, 86% in Year 3, and 100% in Year 4 and Year 5.	Moderate (10%)

Security And Compliance

Benefit summary. The future of computing will be multicloud and hybrid, and if security leaders thought their footprint of digital assets was already difficult to protect, it's only going to get worse.¹² 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).

IBM Services helped companies wade through security and compliance challenges despite complex and bloated legacy environments. Meanwhile, interviewed customers felt IBM hardware (such as Z Systems) was the most secure equipment in the market. And for those considering cloud, IBM Cloud delivered demanding encryption and compliance certificates by default. With Red Hat's platform and services sitting at the center of these environments, interviewed customers could secure, monitor, and demonstrate adherence to the strictest security and regulatory standards while also streamlining processes — saving labor and avoiding remediation costs, fines, and lost sales.

Impact to financial services. Financial services firms face stringent compliance requirements and are subject to relentless attacks due to the sensitivity and importance of their apps and data. As the industry is pressed to offer new digital offerings with better CX, companies are struggling to deploy technology that can meet these stringent needs. Interviewees trusted IBM to understand their industry and guide them towards modernization with top-notch hardware, software, and professional services to meet their security and compliance needs.

Benefits for interviewed financial services customers include:

- › **A North American regional bank needed to access cloud benefits, without the risk, driving the company to adopt IBM Z with Red Hat OpenShift and IBM Cloud Paks.** The company was concerned by potentially massive data fines for GDPR and CCPA and a major, embarrassing public data breach for a competitor bank as the VP and information security officer explained: "Our data set is in so many places with SaaS and the mainframe, but now there's so many rules with CCPA and GDPR that it is a huge challenge. IBM and Red Hat can pull this together by providing the fundamental platform."
- › **The global secure payments and communications company relies on IBM and Red Hat to power fast, highly secure transmission and storage of data for global payments and communications.** Security and compliance are of the utmost importance to protect from costs and lost sales and to win and retain clients. The head of IT operations 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 Enterprise Linux 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."

"We need to be stable and resilient. We're a major target [in an emerging market], and we need to stay in front of the security space. You get enterprise-class security and stability with IBM Z. It's encrypted at the machine level, which is very important. The number of people knocking on doors goes up every year. But even if an attacker gets into an endpoint or on our network, they can't traverse our environment. Our data is behind a hardened central area. We feel really good about it"

Chief technology and operations officer, APAC financial services



"IBM Z is never broken into. It's an enclosed system. You will never see it get hacked. You will never see data leaks. That's why we use it for all our core processing, client onboarding, mortgage and interest calculations, and beyond. But we need to put our user experience closer to the data itself and remove intermediaries, so Red Hat OpenShift is perfect for allowing our customer-facing applications to connect directly with our secure z/OS environment with good UX, integration, and technology."

VP and information security officer, NA regional bank



- › **An Asian national bank pushed back rising security attacks by deploying IBM Z systems with Red Hat Enterprise Linux.** The chief technology and operations officer said: “We need to be stable and resilient. We’re a major target [in an emerging market], and we need to stay in front of the security space. You get enterprise-class security and stability with IBM Z. It’s encrypted at the machine level, which is very important. The number of people knocking on doors goes up every year. But even if an attacker gets into an endpoint or on our network, they can’t traverse our environment. Our data is behind a hardened central area. We feel really good about it.”

Financial model. The *sample bank*’s investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$3 million, slashing the likelihood of a breach by 80% and avoiding \$292,000 in fines per year. Forrester found that 53% of firms have had a breach in the past year, with 10% leading to lost customers.¹³ The *sample bank* earns \$5 billion in revenue per year at a 30.5% net profit margin, and breaches are assumed to affect only 1% of customers, resulting in \$1,525,000 in projected losses per breach. Forrester recognizes that the potential likelihood and size of breaches or compliance fees will vary substantially. While this calculation reflects a conservative approach to project risk reduction based on current averages, the actual value will vary.

“IBM is world-renowned for the height of enterprise security. There is a tangible gain from utilizing IBM, because breaches or compliance failures — even just a one-off — would ruin us, especially through social media and negative press. Our company and our clients bill themselves as un-penetrable, so we must safeguard the brand at all costs.”

Head of IT operations, secure payments and communications



Security And Compliance: Calculation Table

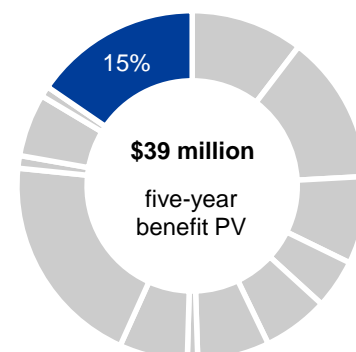
AVOIDED COMPLIANCE FINES	LOST SALES PER BREACH	LIKELIHOOD OF A BREACH	REDUCED LIKELIHOOD WITH IBM AND RED HAT	ENVIRONMENT IN IBM AND RED HAT	RISK ADJUSTMENT
\$292,321 per year	\$1,525,000	53%	80%	57% increasing to 100% by Year 4	Very high (20%)

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 — boosting CX, which 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 financial services. Rising competition from low-cost, digital-first market entrants are pushing longstanding financial services companies to the brink. Companies must guarantee dependability and performance, with B2B and B2C customers more likely than ever to switch vendors due to poor experiences. Companies must then invest in digital-first capabilities such as mobile apps, contactless payments, digital support, and beyond to meet current expectations. Finally, companies must look to the future with AI, Blockchain, IoT, and Edge to find new uses for their data and build new offerings to fight for long-term growth and market share. Financial services customers shared:

- › **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



Business growth:
15% of total benefits

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.”

› **A European financial services company accelerated development to respond more quickly to customer needs and opportunities.**

The company has been able to expand from five to 15 development teams simultaneously working in the environment, which was not possible with its prior static environments. Further, the company could now automatically fire new IBM Cloud Pak containers and have the development team up and running within 15 minutes.

› **A North American regional bank pooled data across its IBM Z, cloud, and SaaS environments to enable analysis driving new business innovation, enhancements, and tools.** The VP and information security officer explained: “Our IBM mainframes do all the core banking processing, client onboarding, mortgage calculations, interest calculations, and beyond. But to meet millennial market needs, we need to make mainframe data sets available with technology, integration, and user experience. With Red Hat OpenShift, we can enable direct interaction between mobile devices and the mainframe without intermediary technologies. We can now promote ‘mainframe in the cloud’ to retain processing speed while using both structured and unstructured data to enhance the features and functions of our applications. There are so many use cases that Red Hat can bring to the table for our IBM mainframes.”

Financial model. The *sample bank’s* investment in IBM and Red Hat yields a five-year risk-adjusted present value of \$39 million. Platform-driven CX and dependability boosts retention and enrichment for a 1% increase in topline revenue, delivering up to \$15 million in additional net income. Launch of 12 new customer-facing apps delivers at least \$3 million in annual net income. Modeled business growth is representative of interviewed customers. However, a very high risk adjustment is levied as impact to revenue will vary widely for every 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.

“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



“To meet millennial market needs, we need to make mainframe data sets available with technology, integration, and user experience. With Red Hat OpenShift, we can enable direct interaction between mobile devices and the mainframe . . . [and use] structured and unstructured data to enhance the features and functions of our apps.”

VP and information security officer, NA regional bank



Business Growth: Calculation Table

CX-DRIVEN RETENTION AND ENRICHMENT	ENVIRONMENT IN IBM AND RED HAT	NEW APPS DEVELOPED	PER-APP REVENUE OPPORTUNITY	NET PROFIT MARGIN	RISK ADJUSTMENT
0.5% to 1% increase for \$5 billion annual revenue	57% increasing to 100% by Year 4	60 total; at least 12 customer-facing	\$10 million, 25% minimum success rate	30.5%	Very high (20%)

Unquantified Benefits

Interviewed organizations also experienced the following benefits that were either unique to their business or that they could not yet quantify:

- › **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.
- › **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.¹⁴
- › **Enhanced efficiency for security professionals.** IBM Cloud Pak for Security on RHEL and OpenShift helped security professionals automate processes, conduct tasks more easily with better UX, and streamline monitoring across the hybrid multicloud environment. Teams saved time monitoring, detecting, remediating, and reporting while detecting risks faster and accelerating remediation.
- › **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.
- › **Fraud prevention.** Companies deploying IBM Blockchain can leverage its distributed and tamper-resistant nature combined with platform monitoring and automation to reduce the likelihood of fraud.
- › **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



"We are working on using AI capabilities to look at our data pool and using IBM Watson to go through our zOS and cloud environment to do analytics across the data set. It helps detect fraud like artificial accounts and identifies new use cases. But our goal is beyond just Watson because, with the Red Hat API, we can use anyone's AI tools to choose the right solution for the right task no matter what."

VP and information security officer, NA regional bank



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 as needed (like the COVID-19 pandemic), 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.

“AI will influence every significant client interaction in the next five years.”

VP, financial services



“It doesn’t matter where the data comes from and where it executes. With Red Hat OpenShift and its APIs, there are no limitation or costs for the different integrations, resources, and regions you tackle.”

VP and information security officer, NA regional bank



“Financial markets are governed by myriad agencies, and things can change with almost no notice. We need to be able to pivot quickly and adapt, so building a platform and using vendors that provide that pivot capacity is essential — which IBM and Red Hat can do.”

Head of IT operations, secure payments and communications



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	\$3,150,000	\$13,596,975	\$20,790,047	\$28,585,596	\$35,545,356	\$36,352,092	\$101,019,271
Professional services for transformation	\$15,750,000	\$15,750,000	\$15,750,000	\$5,250,000	\$0	\$0	\$47,029,113
Professional services for management and support	\$0	\$5,250,000	\$5,250,000	\$5,250,000	\$5,250,000	\$5,250,000	\$19,901,631
Training	\$2,512,400	\$735,346	\$701,659	\$675,629	\$661,848	\$661,848	\$5,131,396
Total costs	\$21,412,400	\$35,332,321	\$42,491,706	\$39,761,225	\$41,457,204	\$42,263,940	\$173,081,411

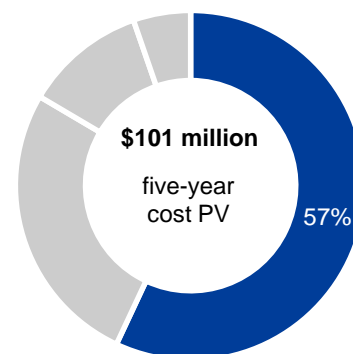
Technology

Data center modernization, cloud migration, and container platform implementation require significant investments in hardware, cloud usage fees, and subscriptions for the platform and software services.

- › New hardware purchases of IBM Z systems replace legacy hardware with higher density at a ratio of 20 legacy racks to 3 IBM Z systems.
- › 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 bank* incurs subscription costs for Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks (Cloud Paks for Applications, Data, and Multicloud Management are included in this model). 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.

Cloud and platform costs grow over time as all noncritical 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.

Forrester's model for the *sample bank* shows \$127 million in technology savings versus \$101 million in technology costs over five years, for a net savings of \$26 million and avoided additional TCO overhead of 26%.



Technology:
57% of total costs

Technology: Calculation Table

HARDWARE DEPLOYMENT	HARDWARE PURCHASES	ANNUAL SUPPORT	RACKS ELIMINATED	NUMBER OF CLOUD APPS	CLOUD/PLATFORM COST PER APP	RISK ADJUSTMENT
Six IBM Z systems (replacing 40 legacy racks)	\$3 million	\$450,000	20 increasing to 80 by Year 4	64 increasing to 160 (adjusted to reflect resource savings from benefit section)	\$195,000 to \$214,000	Low (5%)

Professional Services

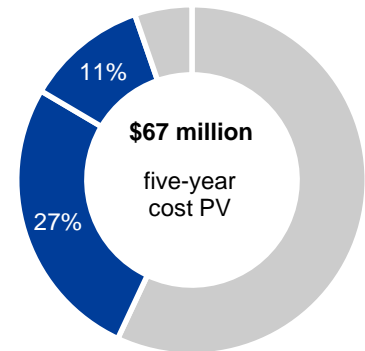
Organizations turned to professional services from IBM and Red Hat to determine strategy, test, deploy, and support their modernization efforts. These services could be one-time or recurring, and they often carried significant costs in the millions. However, organizations felt these services were essential: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

Forrester interviewed organizations with experience partnering with:

- › Red Hat Container Adoption Program, Red Hat Open Innovation Labs, and IBM Garage to learn to use modern architectures, to improve existing applications with new technologies, and to come up with new, innovative products meeting internal or customer opportunities.
- › IBM Services for large-scale strategy, design, implementation, and deployment of the new environment's hardware, cloud migration, and container platform.
- › IBM and Red Hat services for ongoing support and expertise.

Forrester's model for the *sample bank* assumes usage of the Red Hat Container Adoption Program and 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 reported 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.

Readers should note that internal labor was also crucial throughout the process from IT administrators, developers, and cross-functional leadership. The *sample bank* is assumed to have transformation work completed using a portion of approximately 50 employees' time. However, this work resulted in a net reduction rather than net increase in internal 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.



Professional services:
38% of total costs

"IBM's professional services have been awesome. Awesome."

Head of IT operations, secure payments and communications



Professional Services: Calculation Table

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

Training

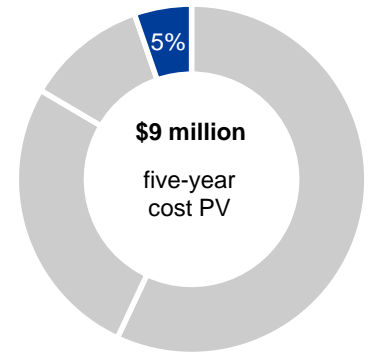
Employees must be trained to use and take advantage of the new platform, architecture, and DevOps practices. Various roles including developers and infrastructure, platform, and middleware administrators will need to learn to use IBM Z systems, IBM Cloud, Red Hat Enterprise Linux, Red Hat OpenShift, 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 find opportunities for innovation.

Interviewees shared that Red Hat's Container Adoption Program, Red Hat Open Innovation Labs, and IBM Garage were invaluable resources to get up to speed quickly. One interviewee explained how significant online documentation from IBM and Red Hat helped employees use the solutions and associated open source technologies while the companies' professional services provided valuable expert assistance when needed. The interviewee said: "IBM has a lot of information on its own eLearning platform to explain to our technical people how to use it, how to implement it, and so on,"

Forrester's analysis for the *sample bank* includes four weeks of initial training for its 100 IT operations administrators and 350 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.



Training:
5% of total costs

"We began to run workshops with the Container Adoption Program for new developers where we would review the process, key learnings, and any pitfalls as an onboarding exercise."

*Chief information officer,
financial services*



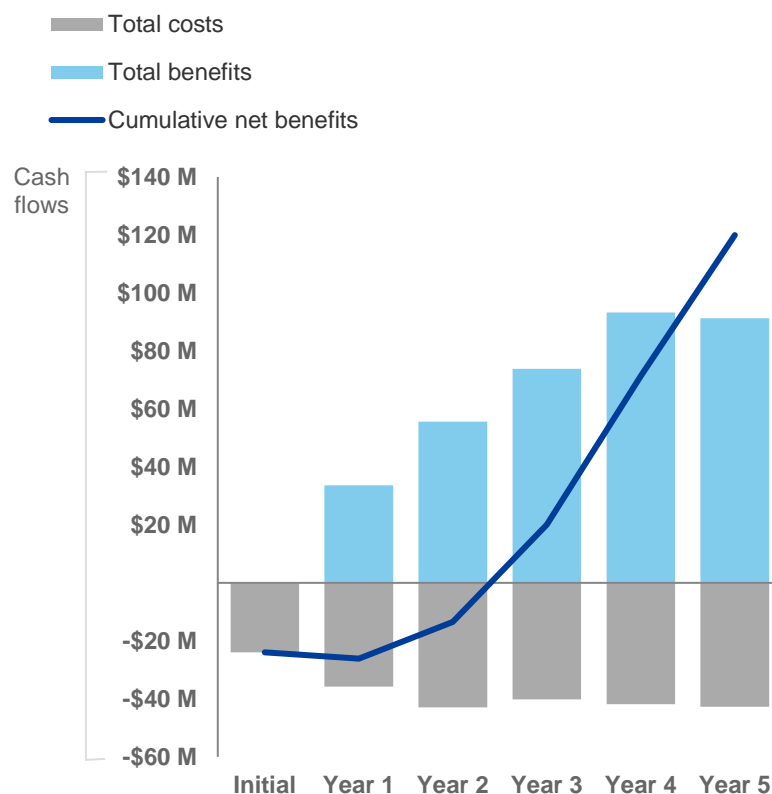
Training: Calculation Table

IT/OPS FTEs	IT/OPS SALARY	DEVELOPER FTEs	DEVELOPER SALARY	INITIAL TRAINING	CONTINUING TRAINING	RISK ADJUSTMENT
100	\$58 per hour	350	\$65 per hour	160 hours	40 hours per year	Moderate (10%)

Financial Summary

CONSOLIDATED FIVE-YEAR RISK-ADJUSTED METRICS

Cash Flow Chart (Risk-Adjusted)



The financial results calculated in the Benefits and Costs sections can be used to determine the ROI, NPV, and payback period for the composite organization's investment. Forrester assumes a yearly discount rate of 10% for this analysis.



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

Cash Flow Table (Risk-Adjusted)

	INITIAL	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Total costs	(\$23,924,800)	(\$35,822,551)	(\$42,959,479)	(\$40,211,644)	(\$41,898,436)	(\$42,705,172)	(\$177,339,809)
Total benefits	\$0	\$33,620,307	\$55,645,458	\$73,769,980	\$93,221,707	\$91,196,237	\$252,273,743
Net benefits	(\$23,924,800)	(\$2,202,244)	\$12,685,979	\$33,558,335	\$51,323,271	\$48,491,065	\$74,933,934
ROI							42%
Payback period							29 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."

The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1 that are not discounted. All other cash flows are discounted using the discount rate at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations in the summary tables are the sum of the initial investment and the discounted cash flows in each year. Sums and present value calculations of the Total Benefits, Total Costs, and Cash Flow tables may not exactly add up, as some rounding may occur.



Present value (PV)

The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total NPV of cash flows.



Net present value (NPV)

The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.



Return on investment (ROI)

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



Discount rate

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



Payback period

The breakeven point for an investment. This is the point in time at which net benefits (benefits minus costs) equal initial investment or cost.

Appendix B: 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.

Appendix C: Endnotes

- ¹ Source: Bob Pisani, “Baby Boomers Face Retirement Crisis — Little Savings, High Health Costs And Unrealistic Expectations,” CNBC, April 9, 2019 (<https://www.cnbc.com/2019/04/09/baby-boomers-face-retirement-crisis-little-savings-high-health-costs-and-unrealistic-expectations.html>).
- ² Source: “Quantifying Coronavirus (COVID-19) For The Technology Channel,” Forrester Research, Inc., March 24, 2020.
- ³ Source: “COVID-19 — Vendors Step Up To Help IT Manage Increased Digital Loads,” Forrester Research, Inc., April 1, 2020.
- ⁴ Source: “Webinar: The Impact of COVID-19 On Financial Services And Insurance,” Forrester Research, Inc., April 7, 2020.
- ⁵ Source: Ibid.
- ⁶ Source: Ibid.
- ⁷ Source: Ibid.
- ⁸ Source: “COVID-19 Tests Wealth Management Firms In Three Critical Areas,” Forrester Research, Inc., March 26, 2020.
- ⁹ Source: “Now Is A Counterintuitive But Ideal Time To Drive A Companywide Innovation Campaign,” Forrester Research, Inc., March 25, 2020.
- ¹⁰ Source: “Agile, DevOps, And COVID-19,” Forrester Research, Inc., March 23, 2020.
- ¹¹ Source: “The Real Costs Of Unplanned Downtime,” Forrester Consulting, Inc., August 2019.
- ¹² Source: “Enterprise Security Vendors Need An Infusion Of Open Source Culture,” Forrester Research, Inc., November 21, 2019.
- ¹³ Source: Business Technographics Global Security Survey, 2019.
- ¹⁴ Source: “The Total Economic Impact™ Of IBM Cloud Pak For Data,” a commissioned study conducted by Forrester Consulting on behalf of IBM, February 2020.