

A Forrester Total Economic Impact™  
Study Commissioned By IBM  
March 2021

# The Total Economic Impact™ Of IBM And Red Hat For The Public Sector

How State, Local, And Federal Public-Sector Organizations In The US Unlocked Value With IBM And Red Hat

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# Table Of Contents

<b>Executive Summary</b>	<b>1</b>
Key Findings	2
TEI Framework And Methodology	5
<b>Market Imperatives</b>	<b>6</b>
Public-Sector Organizations Seek To Accelerate Innovation And Modernization, But They Face Constraints	6
The COVID-19 Pandemic Has Turned Unthinkable Or Far-Off Scenarios Into An Urgent Reality	7
Technology Transformation Is Needed	7
Key Ingredients To Successful Transformation	8
<b>Customer Journey</b>	<b>10</b>
Interviewed Organizations	10
Key Challenges	10
Organizational Imperatives	11
Partner Selection	12
IBM And Red Hat Capabilities	12
<b>Public Sector Model</b>	<b>13</b>
Composite Organization	13
Modeled Deployment	13
<b>Analysis Of Benefits</b>	<b>14</b>
Mission Success	15
Organizational Continuity	18
Development Speed And Efficiency	22
Operational Labor Efficiency	24
Technology Cost Efficiency	26
Flexibility	29
<b>Analysis Of Costs</b>	<b>30</b>
Technology	30
Professional Services	31
Training	32
<b>Financial Summary</b>	<b>33</b>
<b>Appendix A: Total Economic Impact</b>	<b>34</b>
<b>Appendix B: Supplemental Material</b>	<b>35</b>
<b>Appendix C: Endnotes</b>	<b>37</b>

## Key Benefits Of Using Solutions From IBM And Red Hat Together In The Public Sector



**13.2%** reduction in annual technology spend



**48%** of IT administration labor recaptured for added organizational value



**2x** faster app development speed



**\$46 million** in mission success and operational continuity benefits

## Executive Summary

Public-sector organizations at the state, local, and federal level are working to accelerate innovation and modernization to keep pace with rising constituent and employee expectations. A clear transformative path has emerged to modernize and fulfill missions; however, progress is often slow despite employees' best efforts due to a range of challenges from budget constraints to the predominance of legacy systems.

Customer experience (CX) for public-sector constituents is improving, but still lags behind the private sector. Improving CX is critical to boosting key mission success factors such as trust in the organization, likelihood to inquire for official information, compliance with directions, and application rates for optional services.<sup>1</sup> Similarly, government employee experience (EX) also lags behind private sector counterparts. Enhancing EX is essential for public-sector organizations to boost productivity, recruitment, and retention.<sup>2</sup>

Unfortunately, technical debt, legacy systems, siloed teams, and slow processes often hinder public-sector teams' ability to quickly release new or improved services. These teams are often under a simultaneous pressure of budget cuts and increased demand and expectations for their services. Technology transformation in this environment is very challenging, as public-sector leaders have needed to find ways to optimize their teams' efficiency and technology costs to make room for innovation.

Despite these challenges, the COVID-19 pandemic has made velocity even more urgent. Organizations have had to immediately enable remote work, accelerate development, support individuals and businesses, ensure operational continuity, manage public health, drive compliance, and prepare for future budget constructions. Even as the world moves forward, teams continue to be pressed to meet ever-changing challenges and demands with previously unheard-of speed.

Transformation is never easy. Public-sector organizations find success by leveraging container platforms, hybrid technology, open source, and data analysis with the support of strong services partners — all with an eye to mission success, not just meeting budget constraints.

IBM and Red Hat provide a portfolio of solutions that can enable such transformations. Their hybrid container platform is based on open source, can be deployed in most cloud and on-premises environments, and has extensive tooling and interoperability to enable speed, agility, scalability, dependability, portability, and security. IBM and Red Hat professional services leverage deep industry and technical expertise to drive strategy, deployment, adoption, and long-term success of major transformations by using agile methods to enable speed-to-value for the constituent.

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

To illustrate the financial impact of using IBM and Red Hat solutions together — including the benefits, flexibility, costs, and risks of an investment — Forrester designed a sample agency that is representative of and directly based on six interviewed public-sector organizations.

“Our investment with Red Hat and IBM has been amazing compared to where we were.”

*Executive director, housing and urban development*



“Avoiding lock-in is important. As we look at the cloud, how do we establish a container platform? Different vendors have different solutions. **Red Hat and IBM give us the flexibility to have the same environment on-premises and in [multiple third-party clouds].**

Portability is huge for us so we can change when necessary and have the integration and elasticity to handle usage peaks.”

*IT leader, treasury division*



**Portability was one of the most important reasons for public-sector organizations to select IBM and Red Hat solutions.** The hybrid multicloud platform could be deployed in infrastructure and clouds from a wide variety of vendors, enabling access to a much broader ecosystem of services and avoiding lock-in. The open source foundation helped ensure that new applications and tools could be used regardless of future organizational IT decisions.

## Primary Data Sources For Forrester’s Financial Analysis



- **Interviews with six state, local, and federal agencies in the US** as well as 19 organizations in other industries using solutions from IBM and Red Hat together.
- **Nineteen Forrester TEI studies with over 60 interviewed customers** published between 2018 to 2021 examining specific IBM or Red Hat solutions.
- **Public budgets and reports** for state, local, and federal organizations in the US.
- **Forrester’s comprehensive market research.**

The sample agency is a public-sector organization based in the US with an annual technology budget of \$50 million per year (excluding services and labor). The sample agency employs 10,000 onshore FTEs, including 500 developers, 200 IT administrators, 50 data analysts and engineers, and 25 security analysts and engineers. Using IBM and Red Hat solutions and services, it undertakes a four-year technology transformation in which it: 1) deploys a hybrid multicloud container platform based on Red Hat Enterprise Linux (RHEL), Red Hat OpenShift, and IBM Cloud Paks across an IBM and third-party public and private cloud environment; 2) modernizes existing applications; 3) migrates workloads to IBM Cloud; 4) leverages modern architectures to support application development and maintenance productivity; and 5) integrates, rationalizes, and analyzes data from across the organization.

Forrester’s financial analysis found that the sample agency realized incremental benefits of \$200.5 million over five years versus incremental costs of \$135.1 million by modernizing with solutions from IBM and Red Hat, resulting in a net present value (NPV) of \$65 million, a payback period of 28 months, and an ROI of 48%.

## Key Findings

**Benefits.** Forrester modeled the total incremental benefits of \$201 million over five years for the sample agency, including:

- › **Mission success.** IBM and Red Hat drive \$22 million in mission success benefits for the sample agency by enabling it to:
  - Release new and improved digital services.
  - Launch new programs to benefit constituents.
  - Boost CX, engagement, and compliance.
  - Increase workforce speed, efficiency, and impact.
  - Leverage data to the utmost to enhance both service delivery and measurement of mission success.



**ROI**  
**48%**



**Benefits PV**  
**\$201 million**



**NPV**  
**\$65 million**



**Payback**  
**28 months**

“[IBM and Red Hat] allowed us to reduce the cost of IT infrastructure and people. We improved people, process, and technology.”

*CIO, social services*



“IBM and Red Hat have enabled us to allow our staff to maintain their livelihood, feel supported, and stay safe and healthy during the pandemic — all while providing the same level of service.”

*Executive director, housing and urban development*

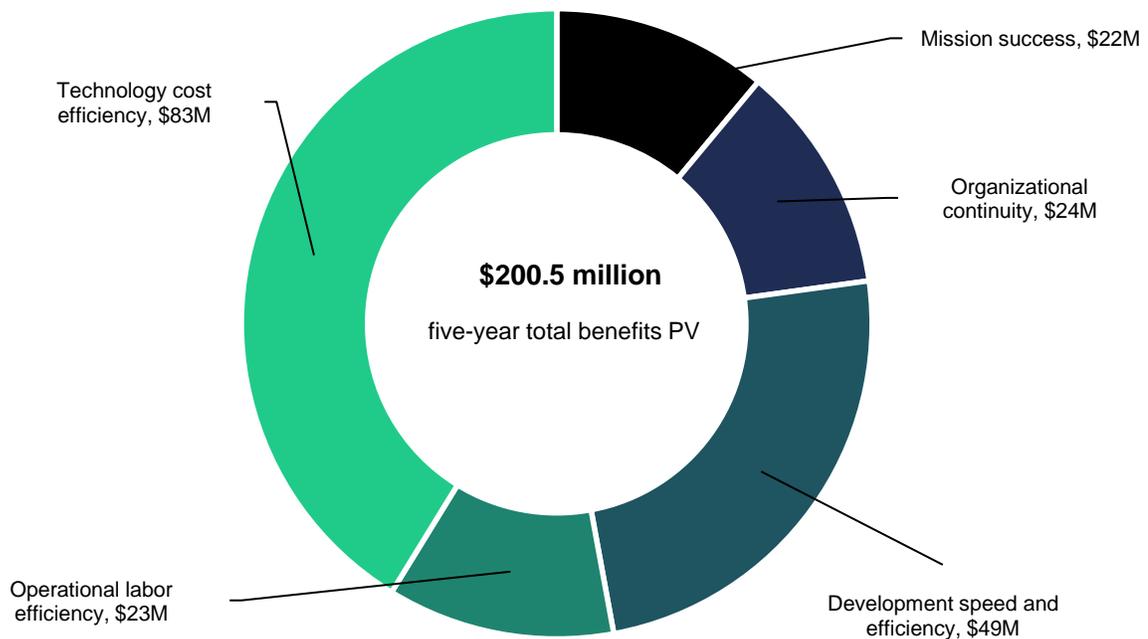


- › **Organizational continuity.** IBM and Red Hat drive \$24 million in organizational continuity benefits for the sample agency by enabling it to:
    - Reduce downtime by 95% with dependability and performance.
    - Strengthen security and boost security productivity by 20%.
    - Better attract, hire, and retain employees with improved employee experience (EX) and more widely applicable skillsets to increase retention by 5% and decrease hiring costs by 30%.
    - Enable remote work and ensure continuity during the pandemic.
  - › **Development speed and efficiency.** IBM and Red Hat drive \$49 million in development efficiency for the sample agency by enabling it to:
    - Double application development speed.
    - Reduce maintenance labor by 25% for replatformed apps.
    - Halve maintenance labor for modernized apps.
  - › **Operational labor efficiency.** IBM and Red Hat drive \$23 million in IT and operations efficiency for the sample agency by enabling it to:
    - Reassign administrators for environments migrated to the cloud and 30% of administrators for remaining on-premises infrastructure deployed with the IBM-Red Hat platform.
    - Reassign 70% of middleware administrators with prepackaged containerized services in the IBM-Red Hat platform.
    - Improve platform and operations productivity by 40%.
  - › **Technology cost efficiency.** IBM and Red Hat drive \$83 million in IT and operations efficiency for the sample agency by enabling it to:
    - Migrate 50% of on-premises infrastructure to IBM cloud, eliminating hardware refresh and operations costs.
    - Reduce resource requirements for apps in the IBM-Red Hat hybrid platform by 20% and by 30% for modernized apps.
    - Reduce licensing costs for apps in the IBM-Red Hat hybrid platform by 10% and by 20% for modernized apps.
    - Avoid overprovisioning hardware to reduce costs by 15%.
    - Gain portability to reduce risk of lock-in.
- Flexibility.** Public-sector organizations gained flexibility to improve employee culture and experience, drive future innovation with lower cost and specialization barriers, and ensure portability.
- Costs.** Forrester modeled the total incremental costs of \$135 million over five years for the sample agency, including:
- › Technology costs for IBM Cloud, RHEL, Red Hat OpenShift, Red Hat Ansible, and IBM Cloud Paks.
  - › Professional services costs for transformation strategy, deployment, modernization, management, and support.
  - › Training costs for technical and business staff.
- Risks.** Forrester has applied a risk adjustment to all financial metrics reported in this study to account for the inherent difficulty in isolating the benefits associated with a complex and broad-reaching set of technology investments during a transformation. While all calculations are informed by metrics reported by interviewees using IBM and Red Hat solutions in tandem, there are many factors that influence the magnitude of benefits realized by any one organization including legacy technologies, organizational capabilities, organizational scale, and market trends.

## Key Benefits Of Transformation With IBM And Red Hat Solutions

Mission Success	Organizational Continuity	Development Speed And Efficiency	Operational Labor Efficiency	Technology Cost Efficiency	Flexibility
<ul style="list-style-type: none"> <li>• Release new or improved apps services for the public and employees.</li> <li>• Improve user experience (UX), performance, and dependability.</li> <li>• Improve CX and service delivery.</li> <li>• Increase capacity, speed, and insight for data analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce security labor and risk.</li> <li>• Improve dependability, availability, and performance.</li> <li>• Enable remote work.</li> <li>• Enable virtual public services.</li> <li>• Improve EX.</li> <li>• Improve the ability to attract, hire, and retain employees.</li> </ul>	<ul style="list-style-type: none"> <li>• Accelerate app development and deployment speed.</li> <li>• Streamline maintenance for containerized apps.</li> <li>• Further streamline maintenance for modernized apps.</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminate administration of on-premises infrastructure with cloud migration.</li> <li>• Streamline administration of on-premises infrastructure with the platform.</li> <li>• Streamline administration of middleware.</li> <li>• Increase productivity for platform and operations administration.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce resource utilization with hybrid container platform.</li> <li>• Reduce resource utilization with app modernization.</li> <li>• Avoid over-provisioning with cloud scalability.</li> <li>• Reduce licensing with hybrid container platform.</li> <li>• Reduce licensing with modernization.</li> <li>• Avoid costs of lock-in with portability.</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance EX and culture.</li> <li>• Deploy additional services using AI, internet of things (IoT), blockchain, and other advanced technologies.</li> <li>• Achieve infrastructure portability.</li> <li>• Reduce lock-in with open source code base.</li> </ul>

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



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 25 organizations using IBM and Red Hat to obtain data with respect to costs, benefits, and risks, including six in the public sector.



### **MULTI-STUDY DATA REVIEW**

Reviewed findings from 19 recent Forrester Consulting studies that examine specific IBM and Red Hat solutions, encompassing over 60 interviews and hundreds of survey respondents for those studies.



### **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 18 of the 25 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 25 interviews.

# Market Imperatives

## Public-Sector Organizations Seek To Accelerate Innovation And Modernization, But They Face Constraints

Government organizations at every level are working to improve constituents' experiences, enhance digital capabilities, and drive higher mission success. Progress is being made as organizations make experiences more emotionally positive, easy, and effective; however, many public-sector organizations still have far to go as they struggle to catch up to sky-high expectations.

For example, Forrester's Customer Experience Index (CX Index™) has found that US federal government agencies are improving yet still hold the lowest average score of any vertical in the index — lagging the private sector by 10.7 points on a 100-point scale. Meanwhile, 73% of these federal agencies have scores in the lowest two categories of the CX Index, compared to only 11% of private-sector brands. Even the weakest performers in 10 out of 13 private-sector industries have outscored the federal average.<sup>3</sup>

Improving constituent experience is critical. Shortcomings can take a real toll, leaving constituents less willing to trust agencies, comply with directives, seek authoritative information, apply for optional services, speak well of agencies, or forgive them for mistakes.<sup>4</sup>

Better experiences are critical for employees too, as organizations with better EX enjoy greater productivity, better resilience, and more employee pride. Unfortunately, organizational challenges in the public sector have led to government employees being less engaged and having lower quality EX, compared to their private-sector counterparts.<sup>5</sup> These EX challenges hold back public-sector employee recruitment, productivity, and advocacy of public-sector services.<sup>6</sup>

Legacy applications, infrastructure, and siloed organizations are certainly common across industries, but they can be particularly troublesome for some public sector organizations that sometimes lack the budget or political backing to drive modernization and change management. This can make it more expensive, difficult, and time-consuming to integrate and improve services both within agencies and beyond their walls to other organizations. Ensuring security is paramount, but organizations remain stuck in outdated environments where the risks and the work involved with protection are both greater.

Constant pressure to reduce budgets and shift capex to recurring, predictable opex has caused organizations to struggle as they accelerate processes. Public-sector technology leaders generally avoid requesting funds for major initial expenditures; they instead prefer to amortize costs over the years to fit their technology investments, within continuing budget resolutions using subscriptions, cloud consumption, and managed services pricing models.

All this means that, despite the heroic efforts of public-sector employees, various constraints can make improving or releasing new services near-impossible for time- and cash-strapped teams that are saddled with technical debt and restrictions.

**“Technology is just as important for the public good as it is for profit in the private sector. Instead of profit, revenue, cash flow, and brand perception, technology for good helps the most vulnerable people in our country, builds sentiment and trust in government, and leads to votes.”**

*CIO, social services*



Public-sector organizations are making progress in their modernization journeys as they seek to improve CX and EX, ensure continuity, and optimize costs. However, the constraints of budget cuts, legacy systems, and siloed teams have hindered the speed and effectiveness of transformation despite employees' best efforts.

## The COVID-19 Pandemic Has Turned Unthinkable Or Far-Off Scenarios Into An Urgent Reality

While no industry was prepared for the COVID-19 pandemic, only 23% of government organizations were prepared for remote work. On the other hand, private-sector organizations were nearly twice as prepared at 41%.<sup>7</sup> Public-sector organizations have moved fast to ensure continuity of operations and employee safety, but for many, the state of legacy technology and processes hindered this speed.

Even more important was speed of innovation to meet new community needs. Any outdated and outmoded ways of communicating and serving constituents can fail hard when social distancing and stay-at-home orders require rethinking and redesigning every interaction and activity. Public-sector employees have been called upon to respond heroically: In response, government organizations have had to quickly roll out apps and websites to help individuals self-assess their risk for COVID-19. With schools, businesses, and government organizations shifting to remote delivery of goods and services, the public sector has scrambled to patch the cracks in access, education, and public health, particularly to:<sup>8</sup>

- › Support individuals and businesses via websites, volunteer connectors, or stitching together a quilt of private- and public-sector resources to serve the greater whole.<sup>9</sup>
- › Ensure continued government operations as employees go remote. Regular operations become that much more essential as a greater number of individuals and businesses may require support — some of them new to making requests, or making requests that are new to organizations.<sup>10</sup>
- › Manage public health by developing apps to gather, analyze, and act on key risk and tracing data and by aiding individuals' connection and support from healthcare providers.<sup>11</sup>
- › Drive compliance of individuals and businesses with health-driven directives and recommendations — despite a deluge of disinformation and political divisiveness combined with deficient public trust and CX with government services.

As public-sector organizations grapple with the here-and-now challenges of the pandemic, they also have an eye to the future as possible budget constrictions loom due to the double burden of increased government costs and lost government funding.

### Technology Transformation Is Needed

Constituent-centric technology transformation drives a government's ability to serve individual citizens, businesses, other government organizations, government employees, and even local and national security. It's the base that supports agility, real-time information, and customization of government services — and in the post-pandemic era, it's now more urgent than ever that agencies quickly adapt and launch new services, benefits, and initiatives.<sup>12</sup> Public-sector organizations that prioritize technology transformation:

- › **Empower constituents to engage with government more often, more proactively, and with better CX.** Digital touchpoints and forms, online payments, automated transactions, digitized scheduling, and remote video all help constituents reach out proactively and apply for

“The COVID-19 pandemic has added a significant amount of manual work to pull, assemble, and publish data and most of it is manual. It's hard to keep up. **Deploying technology and automation quickly is really important.**”

*CIO, health and human services*



The COVID-19 pandemic has forced public-sector organizations to quickly:

- ✓ Enable remote work and fast, agile development.
- ✓ Support individuals and businesses.
- ✓ Ensure continued government operations.
- ✓ Manage public health.
- ✓ Drive individual and business compliance.
- ✓ Prepare for future budget constrictions.

and manage government benefits and services. Digital experiences provide greater ease, speed, and even health and safety during the pandemic as opposed to constituents calling for information and scheduling, driving to an office and waiting for their turn, and mailing or dropping off paperwork.<sup>13</sup> Improved CX makes a real difference in outcomes. For example, a 1-point increase in Forrester's CX Index for federal agencies boosts compliance with directives and advice by 1.9%, enhances trust by 2.8%, increases likelihood to inquire for official information by 2.4%, and drives 2.8% more constituents to sign up for optional benefits and services.<sup>14</sup>

- › **Help businesses that leverage government data and systems (and public-private partnerships) with modern technology infrastructure.** Businesses and partnerships both benefit from faster and more cost-effective digital ways to interact with government. Shared data analytics improves decision-making for both sides with reverberating benefits to economic performance, social outcomes, and public-private partnerships. High-quality, secure, and reliable infrastructure helps stem the risk from cybersecurity breaches, espionage, and cyberextortion that benefits everyone in the ecosystem. Finally, technology even helps to improve sustainability and control costs by sharing infrastructure, data, and resources.<sup>15</sup>
- › **Enhance government speed, efficiency, agility, and cost.** Tech transformation improves both process and service delivery performance metrics. It helps organizations leverage data and intelligence to make smarter decisions, predict and preempt adverse events, provide smarter public services, and secure public infrastructure. Transformation drives innovation and efficiency via agility and scalability; combined with better UX and EX, public-sector organizations can better attract, hire, and retain skilled labor. Public-sector organizations that enhance CX and public engagement with services achieve greater compliance with what they want constituents to do, gain greater public trust, and improve public image.<sup>16</sup>
- › **Improve EX to boost employee retention, advocacy, and productivity while ensuring continuity and employee safety during the COVID-19 pandemic.** Technology transformation has played a crucial role during the COVID-19 pandemic by both ensuring organization's operational continuity and protecting the health, safety, and happiness of employees.

## Key Ingredients To Successful Transformation

Successful technology transformation in the public sector requires strong services partners, container platforms, hybrid technology, open source, and data collection and analytics:

- › **Services partners.** Many transformations fail before they get started due to processes or skills that hold back progress. Public-sector organizations can drive true change by working with competent professional services partners, with the right technical tools, and with experience navigating complex legacy environments.
- › **Container platforms.** Container usage is quickly growing and diversifying as organizations realize their capacity to accelerate software development for both new and existing apps, to reduce infrastructure spend, to handle rapid scalability, and to provide portability for on-premises, cloud, and edge environments.<sup>17</sup> Given the

## CX Index Spotlight For The US Federal Government

Federal agencies have made significant progress on improving CX, but they still lag behind the private sector in Forrester's CX Index by 10.7 points. A 1-point increase:

- ✓ Boosts compliance with directives and advice by 1.9%.
- ✓ Enhances trust by 2.8%.
- ✓ Increases likelihood to inquire for official information by 2.4%.
- ✓ Drives 2.8% more constituents to sign up for optional benefits and services.

Successful technology transformation in the public sector is driven by:

- ✓ Services partners.
- ✓ Container platforms.
- ✓ Hybrid technology.
- ✓ Open source.
- ✓ Data collection, integration, and analytics.

agility, speed, innovation, cost effectiveness, and portability, it is no surprise that Forrester predicts that container usage will double from 2020 to 2022.<sup>18</sup> Maximizing container benefits starts with finding the right tool for today's job — and keeping options open for tomorrow.<sup>19</sup>

- › **Hybrid technology.** Government technologies often date back decades. New digital technologies will coexist with legacy technologies for a long time. Unwittingly pulling the plug on critical government infrastructure elements could prove hugely disruptive; however, replacing critical systems will take time and significant budgets. Many public-sector organizations have also invested in on-premises infrastructure; while cloud is a key imperative, the reality is that not all infrastructures will be eliminated and not all workloads will be deployed in the cloud. Organizations also need to be prepared for multicloud fragmentation and cautious of cloud lock-in. Platforms and services that can run and integrate across environments and vendors are and will remain a crucial focus area for tech strategy planning.<sup>20</sup>
- › **Open source.** Open source-based software, cloud, API, and platform architecture helps ensure portability, interoperability, and end-to-end services while opening avenues for cost savings.<sup>21</sup> Ensuring that vendor solutions are based on popular, best-of-breed, and open source frameworks, like Kubernetes or Linux, is crucial to ensure that new code and technologies do not become outdated quickly.
- › **Data collection, integration, and analytics.** Organizations must embrace data analytics as part of government decision-making. The introduction of digital technologies opens up new opportunities to collect and analyze data on asset performance, constituent behavior, the use of public space, crime hotspots, environmental conditions, and many other aspects of government responsibilities.<sup>22</sup>

For many organizations, IBM and Red Hat offer a strong marriage of an operating system, a container platform, and tooling that is based on the most popular open source architectures, which: 1) runs across nearly any hybrid and/or multicloud environment with significant portability and scalability; 2) includes extensive tooling for integration, management, data analysis, and security; and 3) is backed by professional services well-versed in technology transformation.

According to the Forrester report, “The Forrester Wave™: Multicloud Container Development Platforms, Q3 2020,” the IBM and Red Hat container platform, that is based on OpenShift, is the leading platform for both developers and operators. It is also the most widely deployed multicloud container platform. OpenShift is the centerpiece of a unified “open hybrid cloud” container platform strategy and is enhanced with valuable IBM Cloud Paks functionality including management, data, AI, integration, and more. With IBM and Red Hat’s Kubernetes-based platform, organizations can truly “build once, deploy anywhere,” whether they are a cloud-native organization or a large organization with complex legacy application modernization needs.<sup>23</sup>

“Our heritage systems were so old that we couldn't find compatible systems or platforms. That is why Red Hat was appealing — their solutions were the best fit, they gave us room to grow, and they look most likely to remain relevant long into the future.”

*Executive director, housing and urban development*



“Cloud migration and modernization are our top imperatives. We're pushing to get 90% of workloads in the cloud over the next five years, but the fact is that some things can't go to cloud, and you can't move everything overnight. We have a hybrid migration and modernization approach, and **we've found that containerized solutions are particularly important to be successful.**”

*Innovation executive, defense and cybersecurity*



# Customer Journey

## CUSTOMERS' DRIVERS FOR IBM AND RED HAT INVESTMENTS

### Interviewed Organizations

**Organization profiles.** Forrester interviewed decision-makers from six public-sector organizations in the United States at the state, local, and federal level that are customers of both IBM and Red Hat to learn about their experiences utilizing solutions from both companies in tandem.

#### Interviewed Organization Profiles

LEVEL OF GOVERNMENT	NUMBER OF EMPLOYEES
City, county, state, and federal	500 to over 50,000 FTEs

**Interviewed decision-makers.** Forrester interviewed senior decision-makers at these organizations across a variety of sectors.

#### Interviewed Decision-Makers

TITLE	SECTOR
CIO	Health and human services
CIO	Education
CIO	Social services
IT leader	Treasury division
Executive director	Housing and urban development
Innovation executive	Defense and cybersecurity

**Additional data sources.** Forrester has also integrated data from the following sources:

- › Nineteen interviews with companies outside the public sector using IBM and Red Hat solutions in tandem.
- › Findings from 19 recent Forrester Consulting studies on the business value of specific IBM and Red Hat solutions.
- › Public budgets and reports for state, local, and federal organizations in the US.
- › Forrester's comprehensive market research.

### Key Challenges

Interviewed companies faced common pressures from legacy infrastructure, strict compliance and security demands, poor software experiences, and new and rising demands for CX and EX.

- › Poor UX and lacking digital services that held back service delivery, compliance, and CX.
- › Ever-shrinking budgets with inability to request additional funds.
- › Legacy environments, out-of-support technology, and complex custom IT and apps that required excessive maintenance.

Interviewed public-sector customers used a range of the following solutions:

#### IBM

BigFix  
Cloud  
Cloud Pak for Applications  
Cloud Pak for Data  
Cloud Pak for Integration  
Cloud Pak for Security  
Cloud Private  
Db2  
Garage  
MaaS360  
MQ  
Power Systems  
Rational  
Services  
Storage  
Tririga  
Watson  
WebSphere Liberty  
Z Systems  
z/OS

#### Red Hat

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

- › Largely untapped data reserves due to siloed stores and lacking integration, automation, and analytics solutions.
- › Poor UX and lacking technical capabilities for internal employees that wasted labor and limited the impact employees could achieve as they were forced to just “keep the lights on.”
- › Stagnant progress on innovation and modernization.
- › Significant risk of losing essential knowledge with agencies reliant on aging workforces with legacy skills.
- › Lack of flexible, remote ways of working.
- › Difficulty attracting and retaining talent.

The COVID-19 pandemic created additional urgent challenges as organizations needed to:

- › Adopt remote work and services at scale for the first time.
- › Ensure continuity, dependability, and security while remote and despite drastic changes in the level of demand for services.
- › Quickly deploy new or updated services to adapt to new regulations, new public needs, increased or changed demands for service, and new user behaviors.

## Organizational Imperatives

Interviewed decision-makers echoed the market-level challenges and imperatives discussed earlier in this study. While these imperatives were not anything new, the pandemic sparked decision-makers into turning “wants” into critical “needs.” Strategic goals for interviewees’ organizations include:

- › Enhance mission success, service delivery, and CX. Organizations need to react faster than ever before, and they are being pushed by leadership to significantly improve digital offerings and CX.
- › Drive cloud migration and adoption where viable in line with Cloud Smart and similar state and local initiatives.<sup>24</sup>
- › Reduce IT budgets and avoid one-time capex outlays wherever possible, prioritizing predictable, recurring opex spending with cloud consumption and subscription models.
- › Ensure portability and avoid lock-in with technology investments.
- › Streamline administration and maintenance and offload low-value work to cloud and managed services providers.
- › Improve EX to better attract, hire, and retain employees.
- › Enable remote work and flexible work.
- › Improve data sharing, reporting, and analysis to enhance decision-making and services for employees, constituents, and other organizations and businesses that rely on the data.
- › Harden security and compliance to meet protocols such as FISMA or FedRAMP High Impact.<sup>25</sup> State and local organizations often are subject to their own unique rules but may often echo the same requirements.

“We used to build giant monolithic applications in-house, which we then tweaked and refined over years to be very finely tuned. Sustaining and managing them is nearly impossible with administrative overhead alone. Now, we want to avoid developing, tweaking, and customizing to the point that we can’t untangle and break free because they end up costing so much more.”

*IT leader, treasury division*



“Our employees with master’s degrees in policy were doing data entry, instead of working on policy and things that drive us into the future. That’s not what they signed up for.”

*Executive director, housing and urban development*



“Our number one issue is cost. More than 80% of our budget is consumed just keeping the lights on, leaving very little for innovation, modernization, or anything net new. We may have 10 important initiatives we want to do, but all we can afford is 10% of a single initiative. Our primary motivator is to reduce operations and management costs, which will reduce our budgets, but most importantly free up funds for innovation so we can improve service delivery and CX for the public.”

*IT leader, treasury division*



## Partner Selection

The interviewed organizations searched for partners that could:

- › **Enable portability for any hybrid or multicloud environment.** Interviewees chose solutions like RHEL and OpenShift so they could work across any infrastructure and unify private and public cloud environments. They sought the flexibility to place workloads in their optimal environment, considering changing costs and capacity requirements, without being locked in to any one vendor.
- › **Offer best-in-class capabilities with an open source foundation.** Public-sector organizations demand the best in security, e.g., FedRAMP High Impact, and they need powerful integration, monitoring, and management tools to perform their critical functions. Data analytics, AI, and automation are crucial to their ability to enhance service delivery. These capabilities need to be based on mainstream open source foundation to ensure interoperability, payback, and efficiency and to avoid lock-in long into the future.
- › **Drive adoption of modern development workflows.** Interviewed organizations sought to streamline application development and maintenance workflows to increase throughput and to innovate faster. Legacy technology stacks, which had been cobbled together over several decades held them back. They sought a partner that could assist them in adopting new ways of working, including agile, DevOps, and continuous integration and testing methodologies.
- › **Enable the organizationwide modernization effort.** Interviewed organizations sought a partner that: 1) could support broad-based digital transformation goals and 2) has expertise in the public sector, in modern technologies from many vendors, and with large, siloed, and complex legacy environments.

## IBM And Red Hat Capabilities

Organizations that 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.** Modern IBM Z and IBM Power Systems boosted security, performance, and value, as compared to legacy commodity or outdated 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 Watson IBM BigFix, WebSphere Liberty, Db2, MaaS360 MQ, or Watson and Red Hat Virtualization, Ansible, Insights, Gluster Storage, or JBoss.

“We chose IBM Cloud and Services because of the high FedRAMP security and the natural pairing with Red Hat Enterprise Linux. IBM offers good value and expertise all the time, every day.”

*CIO, health and human services*



“The big sell on Red Hat OpenShift and Ansible was the automation. Red Hat is compatible with almost everything, so it keeps us flexible. We hoped it would give us the most cost savings — and it proved to be true. We didn't need employees to do all of the grunt work.”

*Executive director, housing and urban development*



“I am excited with how the IBM Cloud Pak and Red Hat OpenShift model supports many cloud platforms. We are very pleased with how IBM and Red Hat are working together and the integration with hybrid and multicloud environments.”

*CIO, education*



“Red Hat is inherent in everything. Every developer knows Linux, and it's a big part of our migration plans. Developers want to use OpenShift and Ansible because they enable DevSecOps [development, security, operations] processes to gain efficiency.”

*Innovation executive, defense and cybersecurity*



# Public Sector Model

## Composite Organization

To model the Total Economic impact of investing in solutions from IBM and Red Hat for the public sector, Forrester aggregated findings from interviews with six public-sector agencies and 19 other companies across a range of industries to design a composite organization and an associated ROI analysis. This composite organization will be referred to as the sample agency for the remainder of the study. The sample agency is a representative public-sector organization in the US that:

- › Employs approximately 10,000 onshore employees earning an average fully burdened annual salary of \$85,000, including:<sup>26</sup>
  - Five hundred developers earning an average fully burdened annual salary of \$121,000.
  - Two hundred IT administrators earning an average fully burdened annual salary of \$110,000.
  - Fifty data engineers and analysts earning an average fully burdened annual salary of \$146,000.
  - Twenty-five security engineers and analysts earning an average fully burdened annual salary of \$108,000.
- › Operates with an annual technology budget of \$50 million, excluding professional services and labor.
- › Runs 250 apps in its on-premises infrastructure and 25 apps in third-party clouds prior to partnering with IBM and Red Hat.

## Modeled Deployment

The sample agency executes a four-year technology modernization strategy (with a five-year economic analysis) in which it:

- › Partners with **IBM Services** to strategize, plan, and conduct its transformation, implement technologies, design best practices, and provide ongoing management and support.
- › Engages 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 that leverage technologies from IBM, Red Hat, and the open source marketplace such as data, automation, artificial intelligence/machine learning (AI/ML), and edge capabilities.
- › Migrates 50% of on-premises workloads to **IBM Cloud**.
- › Deploys a hybrid multicloud container platform based on **Red Hat Enterprise Linux, Red Hat OpenShift, Red Hat Ansible, IBM Cloud Paks, and IBM Watson** across its entire environment of on-premises, IBM Cloud, third-party cloud infrastructure.
- › Modernizes applications with **container-based microservices architecture and IBM and Red Hat capabilities** to enhance CX and service delivery, increase cost and labor efficiency, and bolster dependability, security, and performance.

Modeled impacts are shown for the most common, consistent solution combinations shared by interviewed customers.

### The sample agency:

- ✓ Partners with professional services from IBM and Red Hat.
- ✓ Migrates applications to IBM Cloud.
- ✓ Deploys a hybrid multicloud cloud container platform based on IBM and Red Hat solutions.
- ✓ Modernizes applications and leverages new technologies to boost CX, efficiency, and continuity.

“We are standardizing our middleware and apps in OpenShift containers and IBM Cloud Paks to enable hybrid and multicloud environments and avoid lock-in, while enhancing services, capabilities, and security.”

*CIO, education*



# Analysis Of Benefits

## BENEFIT OUTCOMES FOR INTERVIEWED ORGANIZATIONS

### Key Benefits Of Transformation With IBM And Red Hat Solutions

Mission Success	Organizational Continuity	Development Speed And Efficiency	Operational Labor Efficiency	Technology Cost Efficiency	Flexibility
<ul style="list-style-type: none"> <li>• Release new or improved apps services for the public and employees.</li> <li>• Improve UX, performance, and dependability.</li> <li>• Improve CX and service delivery.</li> <li>• Increase capacity, speed, and insight for data analysis.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce security labor and risk.</li> <li>• Improve dependability, availability, and performance.</li> <li>• Enable remote work.</li> <li>• Enable virtual public services.</li> <li>• Improve EX.</li> <li>• Improve the ability to attract, hire, and retain employees.</li> </ul>	<ul style="list-style-type: none"> <li>• Accelerate app development and deployment speed.</li> <li>• Streamline maintenance for containerized apps.</li> <li>• Further streamline maintenance for modernized apps.</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminate administration of on-premises infrastructure with cloud migration.</li> <li>• Streamline administration of on-premises infrastructure with the platform.</li> <li>• Streamline administration of middleware.</li> <li>• Increase productivity for platform and operations administration.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce resource utilization with hybrid container platform.</li> <li>• Reduce resource utilization with app modernization.</li> <li>• Avoid over-provisioning with cloud scalability.</li> <li>• Reduce licensing with hybrid container platform.</li> <li>• Reduce licensing with modernization.</li> <li>• Avoid costs of lock-in with portability.</li> </ul>	<ul style="list-style-type: none"> <li>• Enhance EX and culture.</li> <li>• Deploy additional services using AI, IoT, blockchain, and other advanced technologies.</li> <li>• Achieve infrastructure portability.</li> <li>• Reduce lock-in with open source code base.</li> </ul>

## QUANTIFIED BENEFIT DATA AS APPLIED TO THE COMPOSITE

### Total Benefits: Five-Year Cash Flow

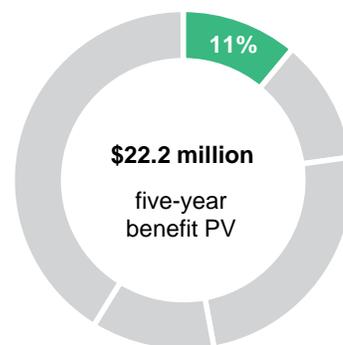
BENEFIT	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Mission success	\$2,284,000	\$4,568,000	\$6,852,000	\$8,552,000	\$8,552,000	\$22,150,829
Organizational continuity	\$3,023,703	\$5,645,544	\$7,880,000	\$7,880,000	\$7,880,000	\$23,609,927
Development speed and efficiency	\$7,138,640	\$11,161,520	\$15,499,920	\$16,367,600	\$16,367,600	\$48,701,672
Operational labor efficiency	\$1,870,000	\$5,142,500	\$7,667,000	\$8,976,000	\$8,976,000	\$23,414,449
Technology cost efficiency	\$9,111,897	\$17,535,462	\$27,020,729	\$29,528,092	\$31,282,329	\$82,668,683
<b>Total benefits (risk-adjusted)</b>	<b>\$23,428,240</b>	<b>\$44,053,026</b>	<b>\$64,919,649</b>	<b>\$71,303,692</b>	<b>\$73,057,929</b>	<b>\$200,545,560</b>

## Mission Success

**Benefit summary.** Public-sector organizations' investments in solutions from IBM and Red Hat enabled them to better serve their constituents. Organizations released new and improved digital services for their constituents with capabilities, UX, performance, and dependability that reduced friction and gained trust from constituents. Better UX led to higher engagement, trust, and compliance, ultimately improving organizations' achievement of mission success. Organizations maximized their data by capturing more, integrating formerly siloed data, automating and streamlining key data processes, and analyzing it with more robust AI and analytics tools. With more data, faster data, and better data, organizations could implement better data-backed policy decisions and measure mission success more accurately.

**Sector impact.** Interviewed public-sector decision-makers described the following benefits for their organizations:

- › An education organization leveraged IBM and Red Hat solutions to enhance the physical security of its schools. By using over 20,000 IoT edge devices, it gathered data that was brought into IBM Cloud in the Red Hat OpenShift environment. That data was then used by IBM Cognos and IBM Watson AI for real-time and predictive analytics used by school police. School security is paramount, and IBM Services helped the education organization design and deploy the system with greater speed and effectiveness. The CIO explained: "We've leveraged IBM Cloud, Watson, and Cognos with Red Hat OpenShift to run IoT sensors for real-time data and predictive analysis on security and maintenance. Real-time security of our schools is absolutely essential, and IBM and Red Hat make that possible." The education organization also used IBM Tririga together with Red Hat JBoss for end-to-end management, maintenance, and analytics of its fleet of vehicles and equipment.
- › A social services organization leveraged IBM and Red Hat solutions to improve outcomes and CX for constituents. It particularly valued the IBM Watson Platform, which was integrated with open source and third-party solutions for data analysis and insights to plan services and measure their impact. IBM Watson was also used for training and scoring of employees in complex scenarios, helping to ensure staff were ready for the difficult tasks before them. The CIO shared: "I love the IBM Watson platform — it is amazing, one of the best."
- › Improving CX was crucial for a division of a state or federal treasury organization. By building new and improved digital offerings for constituents, the organization worked to increase CX in order to increase compliance, speed, and accuracy. Improving compliance by just 1% would significantly benefit budgets for the government entities supported by this organization. The organization also worked to tap into the large quantities of data that it produces and consumes. It currently is in the early stages of using IBM and Red Hat solutions to better structure and access the data and then leverage AI/ML and deep learning to enhance the organization's efficiency and mission success.



Mission success:  
\$22 million over five years

Mission success is different for every organization.

Examples include:

- ✓ Release of new and improved apps.
- ✓ Launch of new programs to serve or benefit constituents.
- ✓ Enhanced CX or UX.
- ✓ Increased compliance or engagement.
- ✓ Increased capacity, speed, and insight of data analysis.
- ✓ Improved workforce efficiency or EX.

## INTERVIEWEE SPOTLIGHT:

### HOW IBM AND RED HAT ENHANCED MISSION SUCCESS FOR A HOUSING AND URBAN DEVELOPMENT ORGANIZATION

This organization helps constituents that are in need get good housing for their families and gain access to transportation, education, employment, and other community-based services. Mission success depends on directly helping people today, with the long-term goal being to improve the health, happiness, safety, and prosperity of the entire community. With IBM and Red Hat, the organization: works with greater speed and efficiency; leverages data to a much more impactful degree; delivers new and enhanced services for constituents; improves CX and therefore constituent compliance and engagement; and ensures that it uses funding and resources to maximize its mission impact.

- › **CX, compliance, and engagement.** The organization used IBM and Red Hat to improve performance, availability, and dependability of digital services. It launched new digital forms and portals to easily find, submit, and manage applications — all with built-in, two-factor security and e-signatures. As a result, constituents' engagement with the organization became faster and easier.

Additionally, the coronavirus pandemic, and the resulting quarantines of US states, has forced the general public to essentially avoid physical interaction. For constituents, this means avoiding public transportation and physical offices, where key tasks, such as document notarization, would otherwise take place. The newly improved CX can increase the likelihood that these constituents are able to safely and effectively engage with the organization to take advantage of digital services.

- › **Efficiency and speed.** Enabling speed and efficiency was essential to the organization, and the IBM-Red Hat platform maximized savings. The executive director shared: “Data comes into our organization from everywhere, and we need to convert it into a consistent language to be read by our internal programs. It took tons of work. Everything that was built needed to account for anything and everything. As a result, our experience policy staff was just sitting there doing data entry.”

Systems are now automatically integrated, and employees need only to hit a button to capture or analyze data. Data enters systems automatically with new digital forms for constituents. By automating the drudgery of data collection and analysis, the organization allowed for natural attrition of 15% and shifted 50% of its remaining labor hours across a 17-person policy data team to higher-value work. This allowed it to recapture over half a million dollars in annual salary.

The executive director shared: “We've freed up time for our administrators and analysts to spend time in other finance programs. For example, neighborhoods shift substantially over time in demographics, employment, etc. What they need changes with it. We need to assess what they need frequently to make sure our policies actually meet their needs — with Red Hat and IBM, we've finally been able to do that.”



IBM and Red Hat helped the housing and urban development organization achieve greater mission success by:

- ✓ Capturing more data with greater accuracy.
- ✓ Bringing together disparate data sources.
- ✓ Analyzing more data.
- ✓ Completing more reports and analyses with the same headcount.
- ✓ Completing concurrent analytics projects.
- ✓ Analyzing data faster.
- ✓ Releasing data to the public more quickly.
- ✓ Making policy decisions faster.
- ✓ Making better-informed, data-backed policy decisions.

“Prior to using IBM and Red Hat, we were only doing the bare minimum of what needed to get done. It took all-hands-on-deck to just do that. No innovative thought was happening because work was too time-consuming. Now that we freed time with Red Hat and IBM, our policy analysts switched from working on applications and data entry to having their hand on the pulse of the community.”

*Executive director, housing and urban development*

› **Enhanced data insights.** The organization isn't just saving time — it is enhancing the data analysis itself. Data comes in more accurately and quickly, and it can be processed much faster and in more advanced ways. For example, employees can join disparate data sources for broader analysis, as the executive director explained: "We used to do a ton of work to compare poverty and income data sets. But now, we can quickly get data and cut it by other factors like school scores, employment, and transportation with IBM Watson." Using advanced analysis and AI tools, employees can dive deeper into the data and find insights they never would have had the time or analytics capabilities to uncover in the past.

This increase in speed, quantity, and deeper insight all makes a real impact. The executive director shared: "Our work has a crucial impact. Housing is everything — how can kids go to school and be successful without a safe place to sleep? But we didn't have staff to measure what the community needed and what impact we were having."

› **Mission success.** By leveraging data to its utmost, freeing time for important work, and improving CX, the organization is more effective at improving the lives of its constituents, gaining access to more budget, reducing costs of services, and enabling long-term tax growth with rising prosperity for taxpayers. The executive director explained: "We are now able to be better informed to make sure we do projects where they are needed. You can't just put a building somewhere — you need to put it in the right neighborhood to help people find permanent housing and support themselves rather than ending up in a homeless shelter — which costs taxpayers money."

"We've redirected time to meaningful work, rather than wasting time on the mundane."

*Executive director, housing and urban development*

"Now, we can collect and analyze data to see how our budget and policies are actually impacting the community."

*Executive director, housing and urban development*

**Financial model.** The sample agency's investment in IBM and Red Hat yields five-year, risk-adjusted PV mission benefits of \$22 million plus further benefits that cannot be financially quantified. The sample agency:

- › **Boosts productivity and output of data teams by up to 60%.** IBM and Red Hat helped capture more data, automate and streamline processes, break down data siloes, and leverage advanced AI and analytics to drastically increase the output, speed, and quality of data analysis work.
- › **Improves end-user productivity by 2%.** With better apps and services, including those built for remote work and those that digitize and automate processes, employees throughout the agency save significant time. Time saved is recaptured for better service delivery. This benefit is a proxy indicator for the ability of the organization to drive greater mission success for its constituents.

Most mission success benefits go far beyond financial benefits to the organization, and this was true across interviewed organizations. Any public-sector organization considering such an investment will need to look at internal metrics that gauge service delivery, engagement, compliance, CX, and beyond to determine the appropriate measurements. No matter what, mission success will always go beyond the financial element of a business case, but it should never diminish the fact that mission success is the single most important benefit to consider when making any technology investment.



### The sample agency:

- Boosts the data team's productivity by 60%.
- Improves end-user productivity by 2%.
- Enhances unquantifiable CX and mission success outcomes for constituents.

## Mission Success: Calculation Table

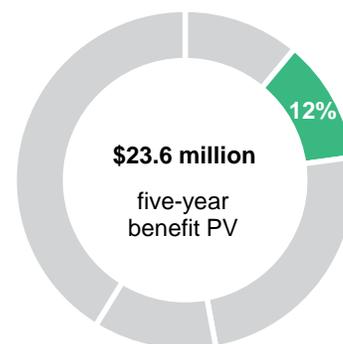
Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
A1	Number of FTEs on data team	Composite	50	50	50	50	50
A2	Percent increase in data team productivity	Interview data	20%	40%	60%	60%	60%
A3	Productivity recapture rate	Forrester	50%	50%	50%	50%	50%
A4	Fully burdened data engineer and scientist annual salary	Bureau of Labor Statistics	\$146,000	\$146,000	\$146,000	\$146,000	\$146,000
A5	Data team labor savings	A1*A2*A3*A4	\$730,000	\$1,460,000	\$2,190,000	\$2,190,000	\$2,190,000
A6	Number of end user employees	Composite	10,000	10,000	10,000	10,000	10,000
A7	Percent increase in productivity	Interview data	0.5%	1.0%	1.5%	2.0%	2.0%
A8	Productivity recapture rate	Forrester	50%	50%	50%	50%	50%
A9	Average fully burdened annual salary for public-sector employees	Bureau of Labor Statistics	\$85,000	\$85,000	\$85,000	\$85,000	\$85,000
A10	End-user labor savings	A6*A7*A8*A9	\$2,125,000	\$4,250,000	\$6,375,000	\$8,500,000	\$8,500,000
At	Mission success	A5+A10	\$2,855,000	\$5,710,000	\$8,565,000	\$10,690,000	\$10,690,000
	Risk adjustment	↓20%					
Atr	Mission success (risk-adjusted)		\$2,284,000	\$4,568,000	\$6,852,000	\$8,552,000	\$8,552,000

## Organizational Continuity

**Benefit summary.** The interviewed organizations significantly improved dependability, performance, and security by: 1) modernizing with the IBM-Red Hat platform; 2) accessing enterprise-grade versions of open source technologies; and 3) leveraging robust hardware, cloud, and platform offerings. IBM Cloud provided high-performance, secure, and dependable infrastructures to run applications and store data. Meanwhile, Red Hat Enterprise Linux, Red Hat OpenShift, and IBM Cloud Paks provided platform services to connect infrastructures, data, and apps with consistent monitoring and management to catch, fix, and prevent issues and vulnerabilities to ensure availability, performance, security, and resiliency. IBM and Red Hat professional services helped design applications and infrastructure for dependability and security.

A previous challenge for organizations was finding specialists to work on niche, outdated technologies, which made it difficult and expensive to attract and hire employees. By implementing modern tools, architectures, and infrastructures, companies could now access a larger workforce with skills in these areas. Modern, consolidated solutions and improved efficiency also improved employee experience, making it easier to attract, hire, and retain employees.

In the face of the COVID-19 pandemic, organizations leveraged IBM and Red Hat solutions to: enable remote work; create new and improved digital solutions for constituents and employees; and ensure operational continuity despite the influx of new demands and challenges.



Organizational continuity:  
\$24 million over five years

**Sector impact.** Interviewed public-sector decision-makers described the following benefits for their organizations:

**EX:**

- › A housing and urban development organization significantly improved EX with IBM and Red Hat and drove a 12% increase in employee retention. The executive director explained: “Now our staff is working on what’s meaningful, rather than being frustrated spending half their workday on data entry — that’s not what they had signed up for. We have talented, senior employees — they would have jumped ship.” Internal metrics predict that the 17-person team would have lost two more FTEs without IBM and Red Hat.

**Security:**

- › A housing and urban development organization hardened their environment and enhanced monitoring and management with IBM Cloud and IBM Cloud Pak for Security, making the security team more efficient, confident, and happy. The organization launched a new portal for constituents with two-factor authentication using the IBM capabilities. This significantly improved data security and the public perception of the organization’s security while enhancing UX and CX.

**Dependability, performance, and availability:**

- › A health and human services organization helped ensure dependability with its IBM and Red Hat investments. Although downtime does not directly lead to lost budget for this organization, it impacts programs and damages their ability to serve constituents. And when problems become recurring or have a large scope, there can be investigations and pressure within the surrounding government entities, causing significant disruption for the organization.
- › A housing and urban development organization vastly improved access and speed for its apps using IBM and Red Hat solutions. Before, only 10 to 15 forms from constituents could be processed at a given time — if more were attempted, the system would crash and prevent citizens from accessing these crucial services. Even when the systems were up, employees and citizens struggled with issues regarding performance, forms, and files not saving, as well as incompatibilities with forms on certain browsers or operating systems. The organization received many complaint calls as a result of this poor CX, which is especially problematic for an agency that provides highly critical services directly to the community. Everything changed with IBM and Red Hat, and now, performance has been excellent, there is no limit to the user base, and availability has been 100%.

**Remote work and service continuity:**

- › An education organization enabled remote work for staff and remote education for students for the first time at the beginning of the COVID-19 pandemic. With the IBM-Red Hat platform, teams could go remote and remain effective, as the CIO explained: “Having our developers work remotely has not affected our ability or speed to develop applications at all for county, local, school, and mobile communities.”
- › IBM and Red Hat solutions were crucial for a housing and urban development organization’s pivot to remote operations for both employees and constituents during the pandemic. The executive director shared: “Had the pandemic happened prior to using IBM and Red Hat, we wouldn’t have been able to work remotely. Because of IBM and Red Hat, no one on our staff has set foot in the office since

“We would have lost more employees without Red Hat and IBM. People are happier with it.”

*Executive director, housing and urban development*



“All our performance and availability issues went away with IBM and Red Hat. It just works now.”

*Executive director, housing and urban development*



“OpenShift supports agile processes and remote work environments for our developers, while letting security and operations teams stay involved to keep things safe and effective.”

*CIO, education*



March. The systems have allowed us to function at the same level or better as when we were all in the office. That means we can keep applications and funding flowing [for our constituents], while allowing us to protect our employees' safety and happiness."

Other departments which passed on the opportunity to invest in the cloud did not fare so well, as the executive director explained: "Other departments that didn't invest in the cloud with IBM and Red Hat are having to ask for volunteers to go back to the office. It's a risk for the employee and for the agency. Who would have had to go to the office? Who would have put themselves at risk? It's not just about the office environment — it's the public transportation, the street, and everyone else they would have interacted with outside the office."

The executive director sees remote work as a permanent part of the department's future for better EX and even retention: "I love that we can offer remote work to our staff. It has made a huge difference for everyone, especially parents, caregivers, and people with underlying health conditions. Since we're just as productive from home, I think that we could go into the office just once per week in the future."

- › The health and human services organization ensured operational continuity and quickly set up automation and apps with IBM and Red Hat solutions to meet new demands brought on by the pandemic. Continuity is essential, as the CIO shared: "IT supports the mission. The service we need to provide is the number one priority, over cost and other considerations. Everything must remain operational. We can't let anything stop us from succeeding on our mission — budgets, security risks, or even the pandemic. We have to make it work."

**Financial model.** The sample agency's investment in IBM and Red Hat yields five-year, risk-adjusted PV continuity benefits of \$24 million plus further benefits that cannot be financially quantified. The sample agency:

- › **Reduces costs associated with unplanned downtime by 95%.** The sample agency realizes direct cost savings for avoided downtime of approximately \$5.5 million per year with IBM and Red Hat.
- › **Strengthens security and improves productivity of security teams by 20%.** The consolidated IBM-Red Hat environment combined with more advanced tools, such as those in IBM Cloud Paks, simplifies and enhances monitoring and remediation, recapturing up to \$270,000 per year in security labor costs.
- › **Improves EX and enhances the ability to attract, hire, and retain employees, boosting retention by 5% and reducing hiring costs by 30%.** Modern, open source technologies with the consolidated IBM-Red Hat platform improved workplace experience and UX, freed time from drudgery and manual tasks for more interesting work, and widened the talent pool with access to popular skillsets. Savings are recognized for developers, IT admins, data teams, and security teams totaling up to \$4.1 million per year across the pool of 775 resources.
- › **Enables remote work and ensures continuity despite pandemic disruption and new demands.** The sample agency is able to rise to the occasion and deliver new and improved digital services demanded by individual constituents, business constituents, government constituents, and internal employees — all while enabling teams to work from home (benefiting their health, safety, and happiness) while maintaining governance and security.

"Switching over to the Red Hat and IBM environment with automation made the unexpected work for us. We never could have functioned the way that we are during COVID-19. Who knows what else life throws at us, but whatever it is, we can get through it."

*Executive director, housing and urban development*



### The sample agency:

- Improves dependability and performance.
- Reduces unplanned downtime by 95%.
- Boosts productivity for security teams by 20%.
- Strengthens cybersecurity.
- Increases employee retention by 5%.
- Decreases employee hiring costs by 30%.
- Enables remote work and ensures continuity despite pandemic disruption and new demands.

## Organizational Continuity: Calculation Table

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
B1	Average annual cost of unplanned downtime	Survey data	\$5,800,000	\$5,800,000	\$5,800,000	\$5,800,000	\$5,800,000
B2	Percent of environment in IBM and Red Hat hybrid multicloud platform	Forrester	38.79%	70.30%	100.00%	100.00%	100.00%
B3	Percent reduction in downtime with IBM and Red Hat platform	Interview data	95%	95%	95%	95%	95%
B4	Avoided remediation cost for unplanned downtime	$B1*B2*B3$	\$2,137,329	\$3,873,530	\$5,510,000	\$5,510,000	\$5,510,000
B5	Number of FTEs on security team	Composite	25	25	25	25	25
B6	Percent increase in security productivity	Interview data	5%	10%	20%	20%	20%
B7	Productivity recapture rate	Forrester	50%	50%	50%	50%	50%
B8	Fully burdened security analyst annual salary	Bureau of Labor Statistics	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000
B9	Security team labor savings	$B5*B6*B7*B8$	\$67,500	\$135,000	\$270,000	\$270,000	\$270,000
B10	Baseline retention rate	Composite	80%	80%	80%	80%	80%
B11	Percent increase in retention	Interview data	2%	4%	5%	5%	5%
B12	Improved retention rate	$B10*(1+B11)$	81.6%	83.2%	84.0%	84.0%	84.0%
B13	Baseline hiring and training cost as a percentage of annual salary	Composite	50%	50%	50%	50%	50%
B14	Percent reduction in hiring costs	Interview data	10%	20%	30%	30%	30%
B15	Improved hiring and training cost as a percent of salary	$B13*(1-B14)$	45.0%	40.0%	35.0%	35.0%	35.0%
B16	Number of developers	Composite	500	500	500	500	500
B17	Fully burdened developer salary	Bureau of Labor Statistics	\$121,000	\$121,000	\$121,000	\$121,000	\$121,000
B18	Hiring cost savings for developers	$B16*(1-B10)*B17*B13 - B16*(1-B12)*B17*B15$ (FTE hiring rounded)	\$1,040,600	\$1,984,400	\$2,662,000	\$2,662,000	\$2,662,000
B19	Number of IT admins	Composite	200	200	200	200	200
B20	Fully burdened IT admin salary	Bureau of Labor Statistics	\$110,000	\$110,000	\$110,000	\$110,000	\$110,000
B21	Hiring cost savings for IT admins	$B19*(1-B10)*B20*B13 - B19*(1-B12)*B20*B15$ (FTE hiring rounded)	\$368,500	\$704,000	\$968,000	\$968,000	\$968,000
B22	Number of data engineers	A1	50	50	50	50	50
B23	Fully burdened data engineer salary	A4	\$146,000	\$146,000	\$146,000	\$146,000	\$146,000
B24	Hiring cost savings for data engineers	$B22*(1-B10)*B23*B13 - B22*(1-B12)*B23*B15$ (FTE hiring rounded)	\$138,700	\$262,800	\$321,200	\$321,200	\$321,200
B25	Number of security analysts	B5	25	25	25	25	25
B26	Fully burdened security analyst salary	B8	\$108,000	\$108,000	\$108,000	\$108,000	\$108,000
B27	Hiring cost savings for security analysts	$B25*(1-B10)*B26*B13 - B25*(1-B12)*B26*B15$ (FTE hiring rounded)	\$27,000	\$97,200	\$118,800	\$118,800	\$118,800
B28	Improved employee experience	$B18+B21+B24+B27$	\$1,574,800	\$3,048,400	\$4,070,000	\$4,070,000	\$4,070,000
Bt	Organizational continuity	$B4+B9+B28$	\$3,779,629	\$7,056,930	\$9,850,000	\$9,850,000	\$9,850,000
	Risk adjustment	↓20%					
Btr	Organizational continuity (risk-adjusted)		\$3,023,703	\$5,645,544	\$7,880,000	\$7,880,000	\$7,880,000

## Development Speed And Efficiency

**Benefit summary.** By modernizing applications and delivery workflows, interviewed organizations reduced costs to maintain existing applications and realized faster time-to-value for new applications. Development teams benefited from robust microservices frameworks, improved dependency management, prepackaged services, and prebuilt automations and integrations. The IBM-Red Hat platform enabled developers to develop and manage workloads across distributed, hybrid, and multicloud environments. Popular open source frameworks were familiar and desirable for developers, and they enabled them to develop with maximum interoperability and experiment with new and leading-edge technologies like AI and IoT.

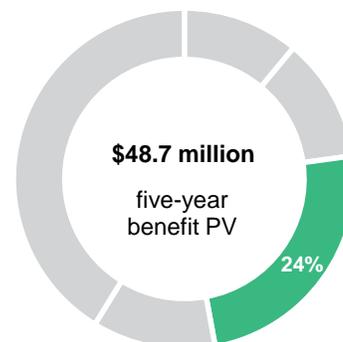
**Sector impact.** Interviewed public-sector decision-makers described the following benefits for their organizations:

- › A defense and cybersecurity organization accelerated app development and maintenance while improving EX with Red Hat Enterprise Linux, OpenShift, and Ansible plus guidance from IBM Services.
- › An education organization drastically increased the speed and efficiency of their developers, reducing headcount from 22 to 12 DevSecOps engineers via natural attrition all while expanding the scope and increasing the speed of the development practice. Gains were achieved as the organization learned to use modern agile and DevOps practices with the help of Red Hat's professional services, deploying Red Hat OpenShift across its hybrid environment and using IBM Cloud Paks for key automation, security, governance, delivery, and management capabilities. As the COVID-19 pandemic disrupted operations, the education organization developed and deployed new apps for distance learning, finance, staff administration, and beyond in only four weeks.
- › A division of a treasury organization slashed app deployment from 27 hours to only 4.5 with its IBM-Red Hat platform and Ansible. Additionally, it was able to increase its release rate from once every nine weeks to once every two weeks. The IT leader explained: "We're making a heavy investment in Red Hat OpenShift and Ansible. It's still in progress, but based on deployment to the first 10% to 15% of our applications, we're expecting huge gains in effort and time."

Deploying applications from code repository to deployment used to take 27 hours even with agile methodologies for a five-person assembly line, including configuration, scheduling, integration, and deployment. It was way worse before that even. But now with OpenShift containers and Ansible, we're down to 4.5 hours total. It's incredible — it's a huge time savings and frees up our people. Instead of releasing every nine weeks, we release every other week. Our sprints are shorter, and we release more updates."

**Financial model.** The IBM and Red Hat investment yields \$49 million in five-year, risk-adjusted PV developer productivity. The sample agency:

- › **Doubles app development speed, reducing timelines from 52 weeks to 26 weeks.** By automating infrastructure deployments, streamlining service integrations, and implementing continuous testing and integration, the sample agency slashes development costs by approximately \$603,000 per application.



Developer speed and efficiency: \$49 million over five years

"We needed to write applications to enable distance learning and keep track of the important data and policies we must follow within our school districts that would be used by teachers, students, and administrators. We used a DevSecOps process with OpenShift to develop and release the apps in only four weeks — the fastest we've ever released apps by far."

*CIO, education*



### The sample agency:

- Doubles application development speed.
- Reduces maintenance for replatformed apps by 25%.
- Halves maintenance for modernized apps.

- › **Reduces app maintenance by 25% for replatformed apps and by 50% for modernized apps.** The tools, automations, and prepackaged services of the IBM-Red Hat platform streamlines maintenance, and developers gain even further productivity while working with the simplicity of the microservices architecture. The sample agency recognizes annual savings of \$46,000 in maintenance labor per replatformed app and \$93,000 per modernized app.

### Development Speed And Efficiency: Calculation Table

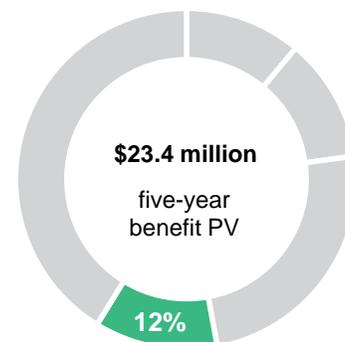
Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
C1	Average size of development team	Composite	10	10	10	10	10
C2	Baseline weeks to develop an app	Composite	52	52	52	52	52
C3	Percent increase in development speed with IBM and Red Hat	Interview data	50.0%	50%	50%	50%	50%
C4	Avoided weeks of labor to develop an app	$C2 * C3$	26.0	26.0	26.0	26.0	26.0
C5	Fully burdened hourly salary for developers	B17/2,080	\$58	\$58	\$58	\$58	\$58
C6	Cost savings per app developed	$C1 * C4 * C5 * 40$	\$603,200	\$603,200	\$603,200	\$603,200	\$603,200
C7	Number of new apps developed	Composite	5	5	5	5	5
C8	<b>Subtotal:</b> App development savings	$C6 * C7$	\$3,016,000	\$3,016,000	\$3,016,000	\$3,016,000	\$3,016,000
C9	Baseline weeks for app maintenance and updates per app, per year	$C2 * 33%$ (rounded)	8	8	8	8	8
C10	Improved productivity for modern app maintenance	Interview data	50.0%	50.0%	50.0%	50.0%	50.0%
C11	Avoided weeks of labor	$C9 * C10$	4.0	4.0	4.0	4.0	4.0
C12	Fully burdened hourly salary for developers	C5	\$58	\$58	\$58	\$58	\$58
C13	Cost savings per modern app	$C1 * C11 * C12 * 40$	\$92,800	\$92,800	\$92,800	\$92,800	\$92,800
C14	Cumulative number of modernized legacy apps in IBM-Red Hat platform	Composite	7	27	53	75	75
C15	<b>Subtotal:</b> Modern app maintenance savings	$C13 * C14$	\$649,600	\$2,505,600	\$4,918,400	\$6,960,000	\$6,960,000
C16	Improved productivity for legacy app maintenance in IBM-Red Hat platform	Interview data	25.0%	25.0%	25.0%	25.0%	25.0%
C17	Avoided weeks of labor	$C9 * C16$	2.0	2.0	2.0	2.0	2.0
C18	Fully burdened hourly salary for developers	C5	\$58	\$58	\$58	\$58	\$58
C19	Cost savings per legacy app	$C1 * C17 * C18 * 40$	\$46,400	\$46,400	\$46,400	\$46,400	\$46,400
C20	Cumulative number of legacy apps in IBM-Red Hat platform	Composite	102	164	222	200	200
C21	<b>Subtotal:</b> Legacy app maintenance savings	$C19 * C20$	\$4,732,800	\$7,609,600	\$10,300,800	\$9,280,000	\$9,280,000
Ct	Development speed and efficiency	$C8 + C15 + C21$	\$8,398,400	\$13,131,200	\$18,235,200	\$19,256,000	\$19,256,000
	Risk adjustment	↓15%					
Ctr	Development speed and efficiency (risk-adjusted)		\$7,138,640	\$11,161,520	\$15,499,920	\$16,367,600	\$16,367,600

## Operational Labor Efficiency

**Benefit summary.** The consolidated IBM-Red Hat platform delivered benefits of cloud and open source across hybrid multicloud infrastructure with enterprise-grade dependability, security, and compliance. IT 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.

**Sector impact.** Interviewed public-sector decision-makers described the following benefits for their organizations:

- › A social services organization improved labor efficiency with IBM and Red Hat, highly outweighing the transformation cost. The CIO shared: “[IBM and Red Hat] allowed us to reduce the cost of IT infrastructure and people. We improved people, process, and technology. Our egress costs in the cloud are always offset by labor savings. Even if we incur an extra \$500,000 in egress costs, we recoup the costs by consolidating technology and saving millions in administrative labor.”
- › A health and human services organization saved labor costs outweighing its investments in IBM and Red Hat solutions. The CIO shared: “We’ve been mandated to reduce IT spending, and cloud is one way to cut down on our costs. Even with data egress costs, we save money in hardware, maintenance, and legacy licensing. When you add in savings from personnel, savings quickly add up to millions of dollars for just a handful of employees.” The CIO continued: “Innovation is built into cloud licensing structures. You transfer the liability and cost of a depreciating environment to the cloud, and no longer have to carry the heavy cost of infrastructure, security, and custom IT administration. The cloud vendor handles security and compliance, such as adhering to FedRAMP High — it’s not our problem any longer. Now, we can focus on our constituents and internal users.”
- › A division of a treasury organization was overly burdened with operational management, and they turned to IBM and Red Hat to reduce the operations and management workload and free teams for innovation.
- › A housing and urban development organization reassigned two of its three technical IT resources by adopting the IBM-Red Hat platform, enabling these experts to dedicate their time to improving apps and services for internal users and constituents.
- › An education organization streamlined administration with IBM and Red Hat, driving significant labor savings. The CIO explained: “Using IBM’s cloud solutions with Red Hat OpenShift gives us a lot of benefits. We save on the data center and costs like cooling and administration. We avoid risk and improved availability. We save on administration and gain efficiency. We don’t have to worry about going in to do administration, especially over the weekend. It helps us transition and use new technologies in our hybrid multicloud environments.”



Operational labor efficiency: \$23 million over five years

“[IBM and Red Hat] allowed us to reduce the cost of IT infrastructure and people. We improved people, process, and technology.”

*CIO, social services*



IBM and Red Hat enabled organizations to reassign **48% of IT administrators**, recapturing up to \$9 million per year in additional value.

**Financial model.** The sample agency's investment in IBM and Red Hat yields five-year, risk-adjusted PV labor savings of \$23 million. This financial benefit is achieved as the agency:

- › **Reassigns up to 30% of infrastructure admins for data center hardware by deploying the IBM and Red Hat platform.** The sample agency begins with 40 admins dedicated to managing data center hardware that remains on-premises. By Year 5 of the analysis period, it reassigns 12 infrastructure admins to higher-value tasks.
- › **Reassigns all infrastructure admins for app environments that are migrated to the cloud.** At the start of the analysis period, the sample agency employs 40 infrastructure admins to manage environments for applications that will be migrated to the cloud. All are reassigned to higher-value tasks with the cloud migration.
- › **Reassigns 70% of middleware admins by using prepackaged services from IBM and Red Hat catalogs.** At the start of the analysis period, the sample agency employs 40 middleware admins. By Year 5, it reassigns 28 of its middleware admins to higher-value tasks.
- › **Improves productivity for platform and operations administrators by up to 40%.** By taking advantage of monitoring, management, and automation capabilities of the IBM and Red Hat hybrid cloud platform, the sample agency increases productivity for platform and operations administrators by up to 40%, recapturing 16 FTEs of additional productivity value from the team.



### The sample agency:

- Reassigns up to 30% of infrastructure admins for data center hardware.
- Reassigns infrastructure admins for environments migrated to the cloud.
- Reassigns 70% of middleware admins with prepackaged services from IBM and Red Hat.
- Improves productivity for platform and operations admins by 40%.

### Operational Labor Efficiency: Calculation Table

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
D1	Baseline infrastructure admins for core hardware	Composite	40	40	40	40	40
D2	Percent of admins reassigned	TEI	7%	20%	25%	30%	30%
D3	Reassigned infrastructure admins	D1*D2	3	8	10	12	12
D4	Baseline infrastructure admins for migratable hardware	Composite	40	40	40	40	40
D5	Percent of infrastructure admins reassigned	Interview data	33%	67%	100%	100%	100%
D6	Reassigned infrastructure admins	D4*D5	13	27	40	40	40
D7	Number middleware admins	Composite	40	40	40	40	40
D8	Percent of middleware admins reassigned	Interview data	5%	30%	50%	70%	70%
D9	Reassigned middleware admins	D7*D8	2	12	20	28	28
D10	Number of platform/ops admins	Composite	80	80	80	80	80
D11	Percent increase in platform/ops admin productivity	Interview data	5%	20%	30%	40%	40%
D12	Productivity recapture rate	Forrester	50%	50%	50%	50%	50%
D13	Reassigned platform admins	D10*D11*D12	2	8	12	16	16
D14	Total reassigned IT admins	D3+D6+D9+D13	20	55	82	96	96
D15	Fully burdened IT admin salary	B20	\$110,000	\$110,000	\$110,000	\$110,000	\$110,000
Dt	Operational labor efficiency	D14*D15	\$2,200,000	\$6,050,000	\$9,020,000	\$10,560,000	\$10,560,000
	Risk adjustment	↓15%					
Dtr	Operational labor efficiency (risk-adjusted)		\$1,870,000	\$5,142,500	\$7,667,000	\$8,976,000	\$8,976,000

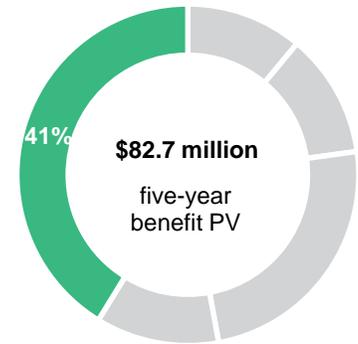
## Technology Cost Efficiency

**Benefit summary.** By investing in the hybrid multicloud IBM-Red Hat platform, interviewed organizations avoided hardware and operational costs, controlled cloud spending, and reduced software licenses needed for workloads. Usage-based fees supplanted capital-intensive upfront purchases of hardware and software licenses, helping organizations modernize technology while working with continuing budget resolutions rather than major budget requests for initial cost outlays. Organizations also reduced lock-in to any one vendor or environment, enabling them to take advantage of opportunities to optimize workloads.

Interviewed customers reported cost savings from: 1) migrating legacy applications to the cloud and replacing legacy hardware; 2) optimizing hardware resources with platform management; 3) optimizing cloud resource consumption; 4) avoiding overprovisioning through cloud scalability; and 5) avoiding software licenses and vendor lock-in.

**Sector impact.** Interviewed public-sector decision-makers described the following benefits for their organizations:

- › An education organization reduced its annual infrastructure spending by 8% to 10% with cloud migration enabled by IBM and Red Hat. The organization uses Red Hat OpenShift, Red Hat Enterprise Linux, Red Hat CoreOS, IBM Tririga, IBM Cognos, and IBM Cloud Paks (Security, Data, and Integration) to work across its hybrid multicloud environment without lock-in. This includes IBM Cloud, IBM Power Systems, IBM Z Systems, a third-party cloud provider, and IoT Edge devices. The IBM-Red Hat platform provides portability to any environment to enable speed, cost efficiency, and security with enhanced capabilities. The CIO described: “We are expanding our investment in IBM Cloud Paks, which are a cloud-native solution based on OpenShift — they can run anywhere OpenShift is supported. This will help us transition our workloads to the cloud, and provide security, automation, integration, and management across the platform.” This expansion and improvement of services is key, as the organization faces increasing demands for cybersecurity, data management, analytics, and beyond.
- › A housing and urban development organization significantly reduced total cost of ownership with IBM Cloud and the IBM-Red Hat platform as it eliminated legacy operating system, platform, middleware, and front-end software along with on-premises hardware costs. The executive director was happy to report that they no longer needed to make budget requests for upgrades, expansions, or refreshes, with stable continuing costs and an always up-to-date environment. They also valued the cohesive IBM and Red Hat vendor ecosystem that simultaneously allowed flexibility for elements to be integrated or moved elsewhere and avoid lock-in.
- › A division of a treasury organization adopted the IBM-Red Hat platform to support its imperatives to reduce IT operating budgets while avoiding lock-in. The IT leader shared: “We want to avoid tying ourselves to something that might get outdated or outclassed in cost, capabilities, usability, and beyond. Avoiding lock-in is important.” The IT leader elaborated about how the IBM-Red Hat platform offered this important flexibility and portability: “OpenShift in the cloud gives us flexibility of an environment that is the same on-premises and off-premises and that is portable to take containers on-premises to IBM or [multiple third-party clouds] or wherever when necessary.”



Technology cost efficiency: \$83 million over five years

“Red Hat solutions like OpenShift, Linux, Ansible, JBoss, and Satellite plus IBM solutions like Cloud Paks, WebSphere, and BigFix are essential to our modernization and cloud migration. They enable the entire process and then make it possible to monitor, integrate, control, and automate across our environment. They play a key role in controlling costs now and opening the door to innovation down the road.”

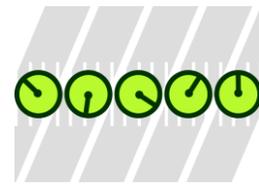
*IT leader, treasury division*



- › Containerization, data center modernization, and data integration were critical for the defense and cybersecurity organization. Using the hybrid approach is key as the organization leads its cloud migration efforts, achieving faster time-to-value for the enhanced capabilities, improved efficiency, and cost savings generated from the transformation.
- › A health and human services organization gained budget predictability as it switched from capex to opex with IBM Cloud and the IBM-Red Hat platform. The CIO described how making budget requests can be politically difficult within the processes of the government jurisdiction it operates in, and that continuing resolutions for consistent cost are far more achievable. The CIO also pointed out that cost is not the only factor, “Cost is important, but the quality and partnership of a service provider is really important.”

**Financial model.** The sample agency saves up to \$31.3 million per year in technology costs for a five-year, risk-adjusted PV of \$83 million. With technology costs incurred from the investment for IBM and Red Hat solutions of up to \$24.7 million per year, the sample agency nets an annual savings of \$6.6 million — a 13.2% total cost of ownership reduction based on its \$50 million annual technology budget. This financial benefit is achieved as the agency:

- › **Migrates 50% of on-premises infrastructure to IBM cloud, eliminating hardware refresh and operations costs.** By moving apps to the cloud and decommissioning server racks in its data center, the sample agency avoids one-time hardware refreshes and operational costs such as power, cooling, and facilities.
- › **Reduces resource requirements for apps in the IBM-Red Hat hybrid platform by 20%.** By deploying RHEL, OpenShift, and IBM Cloud Paks, the sample agency reduces resource requirements for both the remaining legacy hardware and the new cloud environments by 20%, on average. Better utilization translates to fewer servers and lower cloud consumption, which in turn reduces one-time and ongoing costs for hardware, storage, and networking equipment.
- › **Reduces software resource requirements for modernized apps by 30%.** By modernizing applications with microservices architecture and prepackaged cloud services, the sample agency reduces average resource requirements for modernized application workloads hosted in the cloud by 30%, on average.
- › **Reduces licensing costs for apps in the IBM-Red Hat platform by 10%.** The sample agency decreases the number and cost of software licenses by decreasing servers, VMs, and workload requirements and by finding and ending idle workloads.
- › **Reduces software licensing costs for modernized apps by 20%.** Modernizing and refactoring applications further reduces the consumption and licensing costs for modernized apps.
- › **Avoids overprovisioning hardware to reduce costs by 15%.** By running applications in the cloud, and by gaining workload portability across the hybrid environment, the sample agency can move or scale resources quickly. It avoids needing to spend extra for overprovisioning environments to handle potential peaks in demand.
- › **Reduces risk of lock-in.** The sample agency gains workload portability to any on-premises, cloud, or edge environment that supports z/OS, RHEL, Red Hat OpenShift, or IBM Cloud Paks.



**IBM and Red Hat reduced annual technology spend by up to 13.2%, saving up to \$6.6 million per year.**



### The sample agency:

- Migrates 50% of on-premises infrastructure to IBM cloud, eliminating hardware refresh and operations costs.
- Reduces resource requirements for apps in the IBM-Red Hat hybrid platform by 20%.
- Reduces software resource requirements for modernized apps by 30%.
- Reduces licensing costs for apps in the IBM-Red Hat hybrid platform by 10%.
- Reduces software licensing costs for modernized apps by 20%.
- Avoids overprovisioning hardware to reduce costs by 15%.
- Reduces risk of lock-in.

## Technology Cost Efficiency: Calculation Table

BASELINE COMPOSITE METRICS BEFORE IBM AND RED HAT	DEPLOYMENT OF IBM AND RED HAT	IMPACT OF IBM AND RED HAT	FINANCIAL MEASUREMENT FOR THE COMPOSITE
<ul style="list-style-type: none"> <li>Spends \$50 million per year on IT technology alone before beginning the transformation, excluding professional services and labor.</li> <li>Runs 250 apps on-premises with an average of two apps per server rack plus 25 apps in third-party public cloud.</li> <li>Operates 125 server racks with an eight-year server refresh cycle costing \$320,000 per refresh plus \$128,000 in annual operational costs per server.</li> <li>Incurs \$195,000 in annual licensing and subscription costs for essential server and platform services per app.</li> <li>Incurs \$76,800 in middleware and services costs for functionality per app.</li> </ul>	<ul style="list-style-type: none"> <li>Deploys 100% of apps into the IBM-Red Hat hybrid container platform by Year 3.</li> <li>Migrates 50% of the on-premises environment to IBM cloud by Year 3.</li> <li>Modernizes 25% of apps by Year 4 (50% of cloud apps).</li> </ul>	<ul style="list-style-type: none"> <li>Reduced resource consumption by 20% with the IBM-Red Hat platform.</li> <li>Reduced resource consumption by 30% with app modernization.</li> <li>Avoided overprovisioning costs of 15% with IBM Cloud.</li> <li>Reduced licensing costs of 10% with the IBM-Red Hat platform.</li> <li>Reduced licensing costs of 20% with app modernization.</li> </ul>	<ul style="list-style-type: none"> <li>Moderate 10% risk adjustment.</li> <li>Risk-adjusted savings of \$31.3 million per year by Year 5.</li> <li>Savings are offset by \$24.7 million in new risk-adjusted annual tech costs per year by Year 5.</li> <li>The run rate of technology costs is reduced by up to \$6.6 million per year.</li> <li>Versus a \$50 million annual technology budget, IBM and Red Hat reduce technology costs by up to 13.2% per year.</li> </ul>

## Technology Cost Efficiency: Cash Flow Table

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Year 4	Year 5
E1	Replace legacy hardware with cloud migration	TEI model	\$3,528,000	\$7,056,000	\$10,584,000	\$10,584,000	\$10,584,000
E2	Optimize legacy hardware resources with platform management	TEI model	\$672,000	\$1,344,000	\$2,184,000	\$2,184,000	\$2,184,000
E3	Optimize cloud resources with platform management	TEI model	\$2,613,000	\$4,308,876	\$6,122,190	\$6,263,010	\$6,407,070
E4	Optimize cloud resources with app modernization	TEI model	\$409,500	\$1,615,829	\$3,244,761	\$4,697,258	\$4,805,303
E5	Avoid overprovisioning with cloud scalability	TEI model	\$1,959,750	\$3,231,657	\$4,591,643	\$4,697,258	\$4,805,303
E6	Reduce software licensing	TEI model	\$942,080	\$1,927,485	\$3,062,212	\$3,494,435	\$3,574,803
E7	Avoid infrastructure lock-in	TEI model	\$0	\$0	\$234,226	\$889,030	\$2,397,664
Et	Technology cost efficiency	$E1+E2+E3+E4+E5+E6+E7$	\$10,124,330	\$19,483,847	\$30,023,032	\$32,808,991	\$34,758,143
	Risk adjustment	↓10%					
Etr	Technology cost efficiency (risk-adjusted)	$Et*(1-10\%)$	\$9,111,897	\$17,535,462	\$27,020,729	\$29,528,092	\$31,282,329
Ftr	IBM and Red Hat technology costs (risk-adjusted)	Technology cost analysis	\$11,056,500	\$17,447,956	\$23,913,274	\$23,564,576	\$24,667,220
TCOtr	Net reduction in annual technology costs (run rate improvement)	$Etr-Ftr$	(\$1,944,603)	\$87,506	\$3,107,454	\$5,963,516	\$6,615,109

## Flexibility

There are many scenarios in which public-sector organizations might implement solutions from IBM and Red Hat and later realize additional uses and opportunities, including the following:

- › **Enhance employee culture and innovation.** Employees can repurpose time saved to work together and leverage technology to drive further benefits to internal users and constituents.
- › **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 software-as-a-service (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 that was 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.
- › **Meet the rapidly evolving needs of constituents.** Agile workflows, enabled by investments in modern technologies, allow interviewed organizations to better meet the demands of constituents, even though they change rapidly.
- › **Cocreate solutions with constituents.** Shared technology environments foster collaboration between public-sector organizations and their constituents.
- › **Scale proofs of concept.** Modern technologies and methodologies help teams quickly build and test ideas and scale them up with ease once they have been vetted.
- › **Drive further benefits to the world, to communities, to other public organizations, or other private business and organizations.** Technology transformation can serve as foundation for future initiatives to reduce emissions, share data between agencies, enable businesses to do more with public resources, and beyond.

# Analysis Of Costs

## QUANTIFIED COST DATA AS APPLIED TO THE COMPOSITE

### Total Costs

COST	INITIAL	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	PRESENT VALUE
Technology	\$0	\$11,056,500	\$17,447,956	\$23,913,274	\$23,564,576	\$24,667,220	\$73,848,884
Professional services for transformation	\$10,500,000	\$10,500,000	\$5,250,000	\$5,250,000	\$0	\$0	\$28,328,700
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	\$6,969,600	\$1,695,760	\$1,614,140	\$1,551,176	\$1,518,528	\$1,518,528	\$12,990,683
<b>Total costs (risk-adjusted)</b>	<b>\$17,469,600</b>	<b>\$28,502,260</b>	<b>\$29,562,096</b>	<b>\$35,964,450</b>	<b>\$30,333,104</b>	<b>\$31,435,748</b>	<b>\$135,069,898</b>

The sample agency spends approximately \$30 million per year for both technology and professional services from IBM and Red Hat.

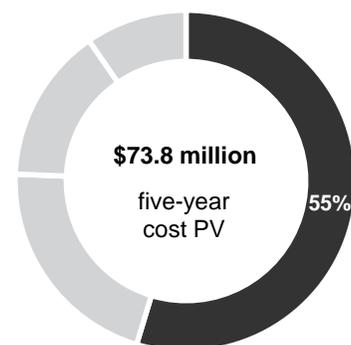
## Technology

Modernization, cloud migration, and container platform implementation require significant investments in hardware, software, and cloud capacity.

The following technology cost assumptions inform the financial model:

- › Fifty percent of on-premises apps are migrated to IBM Cloud. The sample agency incurs usage-based cloud costs for these applications. Cloud models amortized costs by moving to predictable, regular subscriptions and usage fees, rather than upfront license purchases.
- › Red Hat Enterprise Linux, Red Hat OpenShift, Red Hat Ansible, and IBM Cloud Paks for Applications, Data, Integration, and Security are deployed in on-premises infrastructure, IBM Cloud, and third-party public cloud environments as a hybrid cloud container platform. The sample agency incurs subscription costs for these environments. The costs for on-premises environments are offset by the cost savings achieved from replaced solutions, such as operating systems, virtualization, platforms, and management tools. This results in the costs being excluded below as they lead to a breakeven or slight overall decrease.
- › The sample agency may incur additional costs for other solutions such as Red Hat Virtualization and Gluster Storage or IBM WebSphere Liberty, Db2, or MQ.

Forrester's model for the sample agency shows up to \$24.7 million per year in risk-adjusted cloud and platform costs for a five-year, risk-adjusted PV of \$73.8 million in technology costs.



Technology costs: \$74 million over five years

### Technology: Calculation Table

NUMBER OF CLOUD APPS	CLOUD/PLATFORM COST PER APP	RISK ADJUSTMENT
54 increasing to 110 (adjusted to reflect resource savings from benefit section)	\$195,000 to \$214,000	Low (5%)

## Professional Services

Public-sector organizations relied on professional services from IBM to implement and scale modern technologies, avoiding missteps and realizing faster time-to-value. While services represent a significant investment, the interviewed organizations found them to be essential.

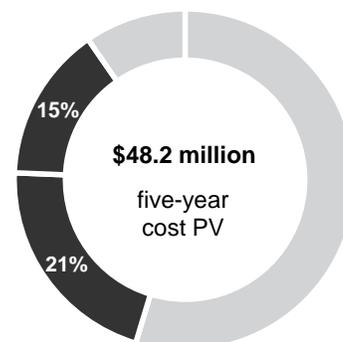
The interviewed organizations leveraged the following professional services from IBM and Red Hat:

- › The Red Hat Container Adoption Program, Red Hat Open Innovation Labs, and IBM Garage to accelerate modernization and product innovation efforts.
- › IBM Services for strategy, design, implementation, and deployment of hardware, cloud technology, and the container platform along with app modernization.
- › IBM and Red Hat services for ongoing support and expertise.

The following assumptions inform the financial model:

- › A total investment of approximately \$28 million for transformation and modernization services over the five-year period of analysis.
- › A total budget of approximately \$5 million per year for ongoing management and support.
- › Actual professional services costs will vary substantially based on the legacy environment, transformation goals, timeline, and selected solutions.

Readers should note that internal labor from IT administrators, developers, and cross-functional leadership was also crucial throughout the process. However, this work resulted in a net reduction rather than in a 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 costs: \$48 million over five years

“The services from IBM and Red Hat were great. The time I spent speaking to them was excellent. I would speak in business language, and they would translate it into the technology language that was needed. They helped us figure out our options, decide what to do, and work together with the technical teams.”

*Executive director, housing and urban development*



### Professional Services: Calculation Table

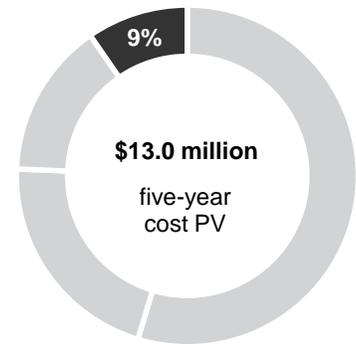
PLANNING, DEPLOYMENT, IMPLEMENTATION	ANNUAL MANAGEMENT AND SUPPORT	RISK ADJUSTMENT
\$28 million over three years	\$5 million per year	Low (5%)

## Training

Public-sector organizations invested in training for developers, administrators, operations experts, and data scientists, among other roles, to ensure employees were well-equipped to leverage modern technologies from IBM and Red Hat. The sample agency:

- › **Delivers initial and ongoing training to IT and operations admins.** The sample agency initially provides 160 hours of training to each of its 200 IT and operations admins. Each year, admins receive 40 hours of additional training. By Year 5 of the analysis, the number of IT and operations admins requiring training declines to 104, since environments based on the IBM and Red Hat hybrid cloud platform are easier to provision and maintain.
- › **Delivers initial and ongoing training to developers.** The sample agency initially provides 160 hours of training to each of its 500 developers. Each year, developers receive 40 hours of additional training.

To produce a conservative estimate of training required to realize the benefits outlined in this study, Forrester applied a 10% risk adjustment to account for unknowns in preexisting skillsets of employees, familiarity with modern architectures, and experience with specific technologies.



Training costs: \$13 million over five years

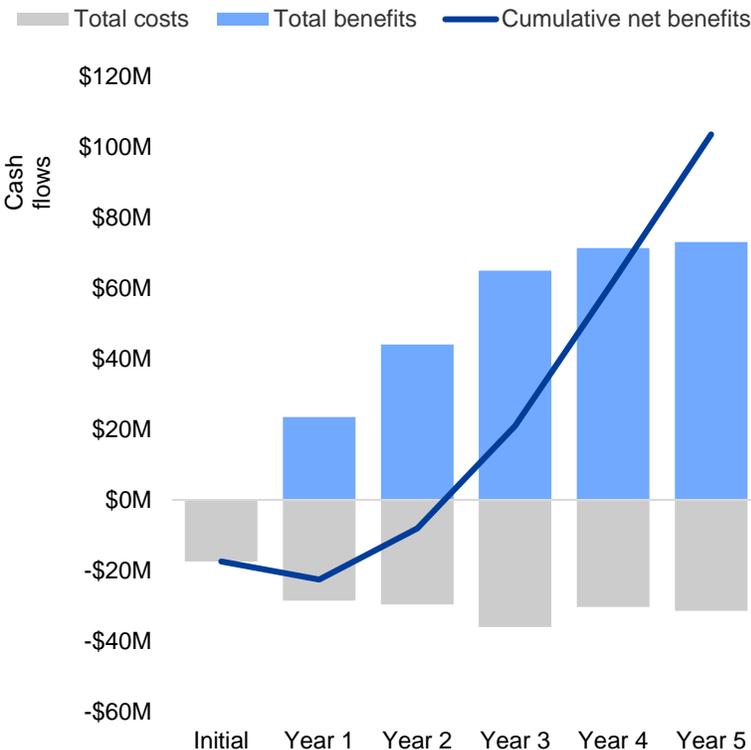
### Training: Calculation Table

IT/OPS FTE	IT/OPS SALARY	DEVELOPER FTE	DEVELOPER SALARY	INITIAL TRAINING	CONTINUING TRAINING	RISK ADJUSTMENT
200 FTEs	\$53 per hour	500 FTEs	\$58 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	(\$17,469,600)	(\$28,502,260)	(\$29,562,096)	(\$35,964,450)	(\$30,333,104)	(\$31,435,748)	(\$135,069,898)
Total benefits	\$0	\$23,428,240	\$44,053,026	\$64,919,649	\$71,303,692	\$73,057,929	\$200,545,560
Net benefits	(\$17,469,600)	(\$5,074,020)	\$14,490,930	\$28,955,198	\$40,970,588	\$41,622,181	\$65,475,662
ROI							48%
Payback period							28 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

This study is part of a series of Total Economic Impact studies that examine the value proposition of using IBM and Red Hat solutions together, which also includes the following studies:

- › “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.
- › “The Total Economic Impact™ Of IBM And Red Hat For Financial Services,” a commissioned study conducted by Forrester Consulting on behalf of IBM, June 2020.
- › “The Total Economic Impact™ Of IBM And Red Hat For Manufacturing,” a commissioned study conducted by Forrester Consulting on behalf of IBM, March 2021.
- › “The Total Economic Impact™ Of IBM And Red Hat For Telecommunications,” a commissioned study conducted by Forrester Consulting on behalf of IBM, June 2020.
- › “The Total Economic Impact™ Of IBM And Red Hat For Transportation,” a commissioned study conducted by Forrester Consulting on behalf of IBM, June 2020.

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

- › “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 Planned And Unplanned Downtime,” a commissioned study conducted by Forrester Consulting on behalf of IBM, 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.
- › “New Technology: The Projected 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’s Design Thinking Practice,” a commissioned study conducted by Forrester Consulting on behalf of IBM, February 2018.
- › “The Total Economic Impact™ Of IBM Garage,” a commissioned study conducted by Forrester Consulting on behalf of IBM, October 2020.
- › “The Total Economic Impact™ Of IBM Multivendor Support Services (MVS),” 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 And Red Hat,” a commissioned study conducted by Forrester Consulting on behalf of IBM, November 2020.
- › “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.
- › “The Total Economic Impact™ Of IBM® Maximo® MRO Inventory Optimization,” a commissioned study conducted by Forrester Consulting on behalf of IBM, May 2019.
- › “Unlock Open Source Technology’s Full Value,” a commissioned study conducted by Forrester Consulting on behalf of IBM, October 2019.

## Appendix C: Endnotes

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- <sup>1</sup> Source: “The US Federal Customer Experience Index, 2020,” Forrester Research, Inc., September 30, 2020.
- <sup>2</sup> Source: “Yes, Government EX Can Get Better!,” Forrester Research, Inc., September 1, 2020.
- <sup>3</sup> Source: “The US Federal Customer Experience Index, 2020,” Forrester Research, Inc., September 30, 2020.
- <sup>4</sup> Source: Ibid.
- <sup>5</sup> Source: “Yes, Government EX Can Get Better!,” Forrester Research, Inc., September 1, 2020.
- <sup>6</sup> Source: Ibid.
- <sup>7</sup> Source: “Best Practices For A Customer-Obsessed Tech Transformation In Government,” Forrester Research, Inc., September 24, 2020.
- <sup>8</sup> Source: “Twenty-Five Ways Governments Innovated To Support Their Customers During The Pandemic,” Forrester Research, Inc., June 19, 2020.
- <sup>9</sup> Source: Ibid.
- <sup>10</sup> Source: Ibid.
- <sup>11</sup> Source: Ibid.
- <sup>12</sup> Source: “The Promise (And Perils) Of Customer-Focused Government Technology Transformation,” Forrester Research, Inc., October 13, 2020.
- <sup>13</sup> Source: Ibid.
- <sup>14</sup> Source: “The US Federal Customer Experience Index, 2020,” Forrester Research, Inc., September 30, 2020.
- <sup>15</sup> Source: “The Promise (And Perils) Of Customer-Focused Government Technology Transformation,” Forrester Research, Inc., October 13, 2020.
- <sup>16</sup> Source: Ibid.
- <sup>17</sup> Source: “Adoption Profile: Containers In North America, Q1 2021,” Forrester Research, Inc., January 6, 2021.
- <sup>18</sup> Source: Ibid.
- <sup>19</sup> Source: Ibid.
- <sup>20</sup> Source: “Best Practices For A Customer-Obsessed Tech Transformation In Government,” Forrester Research, Inc., September 24, 2020.
- <sup>21</sup> Source: Ibid.
- <sup>22</sup> Source: Ibid.
- <sup>23</sup> Source: “The Forrester Wave: Multicloud Container Development Platforms, Q3 2020,” Forrester Research, Inc., September 15, 2020.
- <sup>24</sup> Cloud Smart is the current strategy for agency adoption of cloud-based solutions from the Chief Information Officers Council in the federal Office of Management and Budget, replacing the prior Cloud First strategy (<https://cloud.cio.gov/strategy/>).
- <sup>25</sup> FISMA: Federal Information Security Management Act; FedRAMP: Federal Risk and Authorization Management Program.
- <sup>26</sup> Source: “Occupational Employment Statistics,” U.S. Bureau of Labor Statistics, January 11, 2021 (<https://www.bls.gov/oes/home.htm>). Salaries are calculated by multiplying the annual mean wage by 1.35 to incorporate 35% additional costs of benefits. Salaries are measured specifically for Federal, State, and Local Government in the following roles: Information Security Analysts, Computer and Information Research Scientists, Database and Network Administrators and Architects, Software Developers and Software Quality Assurance Analysts and Testers, and All Occupations.