

A Forrester Total Economic
Impact™ Study
Commissioned By
IBM

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The Total Economic Impact™ Of Migrating From Open Source Application Servers To IBM WAS Liberty

Cost Savings And Business Benefits
Enabled By IBM WAS Liberty

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Executive Summary

IBM commissioned Forrester Consulting to conduct a Total Economic Impact™ (TEI) study and examine the potential return on investment (ROI) enterprises may realize by migrating from open source Java EE application servers to WebSphere Application Server (WAS) Liberty. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of a WAS Liberty migration on their organizations.

To better understand the benefits, costs, and risks associated with a WAS Liberty migration, Forrester interviewed two customers with experience using WAS Liberty and fielded a survey to 30 WAS Liberty users. Liberty enables the WAS server to provision only the application server features required by an individual application when deploying that application. Liberty enables rapid development and deployment of web applications in a simple and lightweight manner.

Prior to migrating to WAS Liberty, the organizations used open source Java EE application servers and had difficulty scaling applications and quickly developing and delivering them. The organizations also struggled with high support costs. Due to these issues, the organizations were not as responsive as needed to business needs, and they were worried about both end user and customer dissatisfaction with slow product releases and application performance. With WAS Liberty, the organizations were able to standardize on one platform with the features and functionality required to enable future growth, streamline and automate development and deployment processes, and streamline application server administration. The results were faster application development and delivery as well as support cost savings. Liberty also positioned the organizations to pursue application innovation. A principal architect noted, “Liberty has been very well-received because it is lightweight, has good performance, and is cloud ready.”

“Moving to WAS Liberty has enabled our applications and our infrastructure to be more agile. We are now better positioned to enable cloud solutions and enable faster turnaround to business needs. We have already seen faster deploy times, better performance, and reduction in overall infrastructure costs.”

~ Lead architect

WAS LIBERTY ENABLES DEVELOPER AND ADMINISTRATOR EFFICIENCIES AS WELL AS COST SAVINGS

A composite organization based on interviews with two Liberty customers and a survey of 30 customers experienced the risk-adjusted ROI and benefits shown in Figure 1. See Appendix A for a description of the composite organization.

The financial analysis points to benefits of \$6,375,810 over three years versus costs of \$2,867,668, adding up to a net present value (NPV) of \$3,508,142.

FIGURE 1

Financial Summary Showing Three-Year Risk-Adjusted Results

**ROI:
122%**

**NPV:
\$3,508,142**

**Payback:
16 months**

**Developer
productivity:
▲ 12%+**

Source: Forrester Research, Inc.

› **Benefits.** The composite organization experienced the following risk-adjusted benefits that represent those experienced by the interviewed and surveyed companies:

- **Deployment time savings for monthly releases.** The organization is able to save one hour per application per release due to Liberty's deployment manager features.
- **Startup time savings for local deployments.** Developers are able to save 40 minutes per day due to Liberty's faster startup times compared with open source application servers.
- **Improved application development productivity by 12%.** Developers are able to access more current features, increase automation, and more easily manage configuration and code changes with Liberty.
- **Administration time savings of 3,600 hours per year.** Liberty's administrative tools are more productive than those of the open source servers, reducing the time needed to administer and manage application servers.
- **Open source support cost savings of \$525,000 per year by Year 3.** The organization had both WAS and open source servers in its environment before standardizing on Liberty, resulting in two support contracts. After moving its open source applications to Liberty, the organization was able to eliminate the open source support contract costs, completely eliminating support costs by Year 2.
- **Infrastructure cost savings of up to \$350,000 per year by Year 3.** The organization is able to run its applications on fewer servers with Liberty due to better resource utilization and smaller footprints, resulting in hardware and software savings.
- **The organization also noted key impact areas that were not able to be quantified.** These include a reduced mean time to resolve outages, a reduced number of incidents per year, and improved application performance that leads to end user productivity and incremental revenue.

› **Costs.** The composite organization experienced the following risk-adjusted costs:

- **WAS Liberty license and support costs.** These are the license and support fees for the applications migrated to WAS Liberty.
- **Internal resource time spent on application migration.** The organization spent 350 hours upfront on planning, and then migrated applications steadily over the first 1.5 years following an initial batch of three key applications.
- **Training costs for developers and administrators.** The organization conducted two days of training for 20 key employees prior to the initial migration. It later conducted training for developers as applications were migrated.

Disclosures

The reader should be aware of the following:

- › The 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 WAS Liberty.
- › 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.
- › IBM provided the customer names for the interviews but did not participate in the interviews.

TEI Framework And Methodology

INTRODUCTION

From the information provided in the interviews, Forrester has constructed a Total Economic Impact (TEI) framework for those organizations considering implementing IBM/WAS Liberty. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

APPROACH AND METHODOLOGY

Forrester took a multistep approach to evaluate the impact that an IBM WAS Liberty migration can have on an organization (see Figure 2). Specifically, we:

- › Interviewed IBM marketing and sales personnel, along with Forrester analysts, to gather data relative to WAS Liberty and the marketplace for WAS Liberty.
- › Interviewed two organizations and surveyed 30 organizations that migrated from open source application servers to WAS Liberty, to obtain data with respect to costs, benefits, and risks.
- › Designed a composite organization based on characteristics of the interviewed and surveyed organizations (see Appendix A).
- › Constructed a financial model representative of the interviews and survey using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews and survey as applied to the composite organization.
- › Risk-adjusted the financial model based on issues and concerns the interviewed organizations highlighted in interviews. Risk adjustment is a key part of the TEI methodology. While interviewed organizations provided cost and benefit estimates, some categories included a broad range of responses or had a number of outside forces that might have affected the results. For that reason, some cost and benefit totals have been risk-adjusted and are detailed in each relevant section.

Forrester employed four fundamental elements of TEI in modeling the WAS Liberty migration: 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 B for additional information on the TEI methodology.

FIGURE 2

TEI Approach



Source: Forrester Research, Inc.

Analysis

COMPOSITE ORGANIZATION

For this study, Forrester conducted two interviews with representatives of:

- › A US-based provider of business services, with approximately \$10 billion in annual revenue and over 50,000 employees. The organization standardized on WAS Liberty and has been migrating applications to Liberty from an open source Java EE application server for approximately one year.
- › A US-based insurance organization, with over \$20 billion in annual revenue and over 30,000 employees. The organization standardized on WAS Liberty and has been migrating applications to Liberty from open source Java EE application servers for less than six months, with plans to migrate all applications within a year.

Forrester also fielded a survey to the following respondents:

- › The 30 respondents were from organizations based in the United States, with an average of 11,500 employees and \$375 million in annual revenue.
- › The respondents have been using WAS Liberty for almost 1.5 years on average, and were migrating an average of 30 applications from open source application servers to Liberty.
- › The respondents are using WAS Liberty for both mission-critical and non-mission-critical applications, with 30% planning to standardize on Liberty.

Based on the interviews and survey, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas financially affected. The composite organization that Forrester synthesized from these results has the following characteristics:

- › Is a US-based organization with approximately \$5.7 billion in annual revenue and 33,000 employees.
- › Has 35 applications to migrate from open source Java EE application servers to WAS Liberty, and is standardizing on WAS Liberty for future application development.
- › Has 300 developers working on the 35 applications.
- › Has been using WAS Liberty for one year.

INTERVIEW HIGHLIGHTS

Situation

Prior to migrating to Liberty, the interviewed and surveyed customers were not standardized on a development platform. The organizations were using a combination of open source Java EE application servers and WAS servers, resulting in high-cost open source support contracts in addition to IBM support, pockets of expertise, and slower development and delivery processes. With Liberty, the organizations had the following objectives:

“With Liberty, one of the biggest benefits is you only configure the components you need. That makes the server startup time very fast. With open source, we had presets and certain minimal standard configurations. That’s a huge time savings for developers.”

~ Principal architect

- › Standardize on one application development platform to gain process efficiencies, eliminate open source support costs, and consolidate to reduce infrastructure costs.
- › Enable a more Agile development and delivery process to further increase efficiency, improve time-to-market for new features and applications, and better position for mobile and cloud development.
- › Improve application performance and reduce mean-time-to-resolve for application outages to boost end user productivity and customer satisfaction.

Solution

After evaluating multiple vendors, the composite organization selected WAS Liberty for its developer tools, highly composable configuration, administration tools, scalability, and smaller footprint.

Once the composite organization chose WAS Liberty, it began deployment:

- › The organization spent several weeks upfront on assessing the impact of migrating each application and the effort that would be involved.
- › Following the upfront planning work, the organization migrated three key applications to Liberty.
- › After these three applications were migrated and the organization was able to validate its assessment and key metrics, the organization migrated the remaining 32 applications over the next 1.5 years. The organization took a staggered approach and migrated applications steadily over this timeframe.

Results

The interviews and survey revealed that:

- › **Developer productivity is an important and immediate benefit.** One of the first benefits that organizations noticed after migrating to Liberty was the improvement in application development and deployment. This is due to a modern and up-to-date tool set for developers, highly composable servers, and the ability to easily make and deploy changes. This allows developers to work in a more agile, continuous delivery capacity. This agility is crucial for next-generation applications built for mobile or cloud.
- › **Standardizing on one development environment enables cost savings.** Instead of having pockets of different application servers, the organizations chose to standardize on Liberty. The benefits of consolidation are largely independent of application server choice. However, organizations viewed Liberty as a platform that could support future application requirements in a way that its open source application servers could not, due to Liberty's modularity, footprint, and cloud enablement. This

“A key benefit with WAS Liberty is the feature set and technology changes, and how frequently those changes get incorporated. With Liberty, we are getting more current feature sets that developers are looking for.”

~ Lead architect

“IBM support really helps to work out the issues with you, and it's easier and faster to get the issues resolved. With open source, it took more time to resolve the issues. IBM is a closer business partner — that is for sure.”

~ Principal architect

resulted in cost savings by eliminating open source support contracts, along with hardware and software savings through improved resource utilization and consolidation with Liberty.

- › **Cloud enablement is an important future benefit.** By migrating to Liberty and improving development and deployment speed and agility, the organization provides the right platform to deliver new applications and application innovation. The organization can better deliver on application requirements like omnichannel, microservices, and dynamic scalability that are important for mobile and cloud applications, enabling the organization to evaluate moving its applications to the cloud.

BENEFITS



Deployment Time Savings

An important benefit from migrating to WAS Liberty is that the organization is able to achieve deployment efficiencies. For its major monthly releases, the organization noticed time savings with Liberty. With open source, large deployments would be time consuming due to having to write a script to deploy the same code on every server and having to verify changes. With the deployment manager with Liberty, much of this manual work is eliminated, creating time savings that scale as the number of servers increases.

The organization migrated 26 applications to Liberty by the end of Year 1 and all 35 applications by the middle of Year 2. To account for the steady migration throughout the year, we assume a 50% benefit realization in the first year, an 80% benefit realization in the second year, and a 100% migration in Year 3 when all applications are on Liberty at the start of the year. For each application, there is an average of 12 major deployments per year and 12 Liberty servers per application. The organization saves 1 hour of total full-time equivalent (FTE) time per deployment, on average. The value of this time is the \$48 hourly fully loaded compensation for FTEs. To be conservative, we assume a 50% productivity capture to recognize that not all time saved will be used for further productive use.

Interviewed and surveyed organizations provided a small range of deployment time savings, since these savings can be affected by application size, among other factors. To compensate, this benefit was risk-adjusted and reduced by 5%. The risk-adjusted total benefit resulting from deployment time savings over the three years was \$16,759. See the section on Risks for more detail.

TABLE 1
Deployment Time Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
A1	Number of applications on Liberty		26	35	35
A2	Number of deployments per year per application		12	12	12
A3	Time per deployment with open source (total FTE hours)		2	2	2
A4	Time per deployment with Liberty (total FTE hours)		1	1	1
A5	Average fully loaded hourly compensation		\$48	\$48	\$48
A6	Productivity capture		50%	50%	50%
A7	Benefit ramp		50%	80%	100%
At	Deployment time savings	$A1 \cdot A2 \cdot (A3 - A4) \cdot A5 \cdot A6 \cdot A7$	\$3,744	\$8,064	\$10,080
	Risk adjustment	↓5%			
Atr	Deployment time savings (risk-adjusted)		\$3,557	\$7,661	\$9,576

Source: Forrester Research, Inc.



Server Startup Time Savings

The organization also realized time savings for local deployments into testing environments with Liberty. With open source servers, there was less flexibility in configuration, and often presets were included that were not needed for the application. With Liberty, developers are able to turn on and off features that they are not using. This highly composable configuration capability results in faster startup times. When developers want to make code changes, they don't have to stop and restart the servers. Developers at the organization have an average of eight local deployments per day, and they estimate that 5 minutes are saved per deployment (reducing startup times from several minutes to less than 1 minute). With 260 working days in the year, this results in \$1,248,000 in time saved per year by Year 3.

Interviewed and surveyed organizations provided a small range of startup time savings. To compensate, this benefit was risk-adjusted and reduced by 5%. The risk-adjusted total benefit resulting from server startup time savings over the three years was \$2,069,827. See the section on Risks for more detail.

TABLE 2
Server Startup Time Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
B1	Number of developers using Liberty		220	300	300
B2	Local deployments per day		8	8	8
B3	Time savings per local deployment (minutes)	5 minutes per local deployment	5	5	5
B4	Time savings per day with Liberty (minutes)	$B2*B3$	40	40	40
B5	Average fully loaded hourly compensation		\$48	\$48	\$48
B6	Productivity capture		50%	50%	50%
B7	Benefit ramp		50%	80%	100%
Bt	Server startup time savings	$B1*(B4/60)*260*B5*B6*B7$	\$457,600	\$998,400	\$1,248,000
	Risk adjustment	↓5%			
Btr	Server startup time savings (risk-adjusted)		\$434,720	\$948,480	\$1,185,600

Source: Forrester Research, Inc.



Application Development Efficiencies

In addition to realizing time savings for deployments into production and testing environments, the organization realized developer efficiencies for application development. This is due to a more current feature set with Liberty, as well as developer tools like Rational Application Developer (RAD) and Rational Software Architect (RSA) that can increase automation and make code and configuration changes easy to manage. By Year 3, all 300 developers have their applications on Liberty for a full year and realize a 12% overall time savings from using Liberty. This results in \$1.8 million in savings per year by Year 3.

Interviewed and surveyed organizations provided a broad range of developer efficiencies, since this can be affected by the level of adoption of new tools and automation, the pace of migration, and the comparison with the prior state. To compensate, this benefit was risk-adjusted and reduced by 10%. The risk-adjusted total benefit resulting from application development efficiencies over the three years was \$2,828,204. See the section on Risks for more detail.

TABLE 3
Application Development Efficiencies

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
C1	Number of developers using Liberty		220	300	300
C2	Average productivity savings		12%	12%	12%
C3	Average annual fully loaded compensation		\$100,000	\$100,000	\$100,000
C4	Productivity capture		50%	50%	50%
C5	Benefit ramp		50%	80%	100%
Ct	Application development efficiencies	$C1 \times C2 \times C3 \times C4 \times C5$	\$660,000	\$1,440,000	\$1,800,000
	Risk adjustment	↓10%			
Ctr	Application development efficiencies (risk-adjusted)		\$594,000	\$1,296,000	\$1,620,000

Source: Forrester Research, Inc.



Administration Efficiencies

With the open source servers, the organization lacked many of the administrative tools that it had with Liberty. Management of open source servers was mostly manual. With the more modern administrative tool set with Liberty, the organization is able to save 3,600 total hours of administrator time by Year 3, when the migration is complete. This results in \$86,400 in time savings per year.

Interviewed and surveyed organizations provided a broad range of administrative efficiencies, since this can be affected by the level of adoption of new tools, the pace of migration, and the comparison to the prior state. To compensate, this benefit was risk-adjusted and reduced by 10%. The risk-adjusted total benefit resulting from administration efficiencies over the three years was \$136,343. See the section on Risks for more detail.

TABLE 4
Administration Efficiencies

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
D1	FTE hours saved for administration/management		2,700	3,600	3,600
D2	Average fully loaded hourly compensation		\$48	\$48	\$48
D3	Productivity capture		50%	50%	50%
D4	Benefit ramp		50%	80%	100%
Dt	Administration efficiencies	$D1 \cdot D2 \cdot D3 \cdot D4$	\$32,400	\$69,120	\$86,400
	Risk adjustment	↓10%			
Dtr	Administration efficiencies (risk-adjusted)		\$29,160	\$62,208	\$77,760

Source: Forrester Research, Inc.



Open Source Support Cost Savings

Prior to standardizing on Liberty, the organization was using open source Java EE application servers and WAS servers. This meant that the organization had a separate support contract for its open source servers in addition to IBM support. The organization standardized on Liberty for future development work due to features like its smaller footprint, modularity, and cloud functionality, which the organization felt were stronger with Liberty than with the open source servers. By standardizing on Liberty, the organization is able to eliminate the open source support contract and consolidate support with IBM. By Year 3, the organization eliminates the entire support cost, for \$525,000 per year in savings.

Interviewed and surveyed organizations provided a broad range of open source support cost savings, since these will depend on varying support levels, different open source vendors, discounts, and the pace of migration. To compensate, this benefit was risk-adjusted and reduced by 10%. The risk-adjusted total benefit resulting from open source support cost savings over the three years was \$826,938. See the section on Risks for more detail.

TABLE 5

Open Source Support Cost Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
E1	Support cost savings		\$390,000	\$525,000	\$525,000
E2	Benefit ramp		50%	80%	100%
Et	Open source support cost savings	E1*E2	\$195,000	\$420,000	\$525,000
	Risk adjustment	↓10%			
Etr	Open source support cost savings (risk-adjusted)		\$175,500	\$378,000	\$472,500

Source: Forrester Research, Inc.



Infrastructure Cost Savings

One of the key advantages of migrating to Liberty is the smaller memory footprint for applications compared with open source. With better resource utilization, the organization is able to consolidate with Liberty and reduce hardware and software costs. The organization starts to see these cost savings toward the end of Year 1, as more applications are migrated, and realizes the full benefit of \$350,000 in cost savings by Year 3.

Interviewed and surveyed organizations provided a broad range of infrastructure impacts, since these will be highly dependent on the prior state and the ability to consolidate with Liberty. To compensate, this benefit was risk-adjusted and reduced by 10%. The risk-adjusted total benefit resulting from infrastructure savings over the three years was \$497,739. See the section on Risks for more detail.

TABLE 6

Infrastructure Cost Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
Ft	Infrastructure cost savings	F1	\$130,000	\$208,000	\$350,000
	Risk adjustment	↓10%			
Ftr	Infrastructure cost savings (risk-adjusted)		\$117,000	\$187,200	\$315,000

Source: Forrester Research, Inc.



Additional Benefit Areas

In addition to the quantified benefits in the tables above, the organization noted key benefit impacts that it was not able to quantify, including:

- **Improved outage resolution and reduced number of outages.** The organization had one or two fewer incidents per year with Liberty than with open source, and the remaining incidents were resolved up to 40% faster with IBM. The organization was not able to derive a cost per hour of downtime, and these costs can vary widely from organization to organization, so the cost savings could not be calculated.

- **A 20% performance improvement with Liberty running on the same infrastructure as open source.** Application performance improvements lead to increases in end user productivity and incremental revenue, but these efficiency gains and revenue enhancements can be both difficult to measure and difficult to attribute to a single technology investment.
- **New application development that provides similar time and cost avoidance as the savings noted above.** While this model focuses on application migration, the organization also developed new applications on Liberty that would have been developed on open source servers in the prior state. For those applications, the organization could calculate a cost avoidance benefit for support and infrastructure required in the prior state. It could also calculate a time avoidance benefit due to efficiencies that exist today that weren't present with the open source servers.

Total Benefits

Table 7 shows the total of all benefits across the six areas listed above, as well as present values (PVs) discounted at 10%. Over three years, the composite organization expects risk-adjusted total benefits to be a PV of about \$6.4 million.

Ref.	Benefit Category	Year 1	Year 2	Year 3	Total	Present Value
Atr	Deployment time savings	\$3,557	\$7,661	\$9,576	\$20,794	\$16,759
Btr	Server startup time savings	\$434,720	\$948,480	\$1,185,600	\$2,568,800	\$2,069,827
Ctr	Application development efficiencies	\$594,000	\$1,296,000	\$1,620,000	\$3,510,000	\$2,828,204
Dtr	Administration efficiencies	\$29,160	\$62,208	\$77,760	\$169,128	\$136,343
Etr	Open source support cost savings	\$175,500	\$378,000	\$472,500	\$1,026,000	\$826,938
Ftr	Infrastructure cost savings	\$117,000	\$187,200	\$315,000	\$619,200	\$497,739
Total benefits (risk-adjusted)		\$1,353,937	\$2,879,549	\$3,680,436	\$7,913,922	\$6,375,810

Source: Forrester Research, Inc.

COSTS



WAS Liberty License And Support Costs

The composite organization incurs WAS Liberty license and support costs once an application has started migrating from open source servers. The composite staggered its migration efforts, so it migrated three applications initially, and then an additional 23 throughout the first year. The license costs as well as prorated support costs for these 26 applications are in Year 1. During the first half of the second year, the composite migrated the remaining nine applications, incurring license costs and prorated support costs for those nine applications, as well as support costs from the 26 applications migrated in Year 1. By Year 3, the organization incurs a full year's worth of support costs for all of its applications on Liberty.

Software costs vary from organization to organization, considering different licensing agreements and other cost formula variables, what other products may be licensed from the same vendor, and other discounts. To compensate, this cost was risk-adjusted up by 5%. The risk-adjusted cost of the WAS Liberty license and support over the three years was \$2,254,447. See the section on Risks for more detail.

TABLE 8

WAS Liberty License And Support Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
Gt	WAS Liberty license and support costs	G1	\$0	\$1,378,000	\$764,000	\$350,000
	Risk adjustment	↑5%				
Gtr	WAS Liberty license and support costs (risk-adjusted)		\$0	\$1,446,900	\$802,200	\$367,500

Source: Forrester Research, Inc.



Internal Resource Time On Migrations

Before the composite organization began migrating applications to Liberty, it spent a total of 350 hours on upfront assessment and planning to determine the impact and effort of migrating each application. Once that assessment was complete, the organization chose three applications to migrate initially. In the following year, the organization migrated 23 applications throughout the year, and in the first half of Year 2, it migrated the remaining nine applications. On average, each application took a total of 240 hours to migrate. For each migration, the organization needed to procure and configure an average of two physical servers. On average, it took 35 hours to stand up each server. The number of servers needed per application is approximately equivalent or less than the number needed with open source, so while there is a small overlap before the open source server is decommissioned, there is no significant net-new hardware cost.

Migration efforts are more variable from organization to organization, considering some manage this in-house while others use third-party help, and the number of people involved and the length of the migration effort will depend on resource availability and application complexity. To compensate, this cost was risk-adjusted up by 15%. The risk-adjusted cost of migration time over the three years was \$555,732. See the section on Risks for more detail.

TABLE 9
Internal Resource Time On Migrations

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
H1	Total hours spent on upfront assessment		350			
H2	Number of applications migrated to Liberty		3	23	9	
H3	Average total FTE hours to migrate application		240	240	240	240
H4	Number of physical servers per application, average		2	2	2	2
H5	Average total FTE hours to set up and configure physical server		35	35	35	35
H6	Average hourly fully loaded compensation		\$48	\$48	\$48	\$48
Ht	Internal resource time on migrations	$(H1+(H2*H3)+(H2*H4*H5))*H6$	\$61,440	\$342,240	\$133,920	\$0
	Risk adjustment	↑15%				
Htr	Internal resource time on migrations (risk-adjusted)		\$70,656	\$393,576	\$154,008	\$0

Source: Forrester Research, Inc.



Training Costs

There was minimal training involved with the migration to WAS Liberty. IBM provided complimentary training sessions upfront for the composite organization. Twenty key staff members were involved in that upfront two-day training session. Additionally, over years 2 and 3, as more developers have their applications migrated to Liberty, they incur approximately 2 hours of training. With a \$48 fully loaded hourly compensation, this amounts to slightly over \$15,000 of training time upfront and \$20,000 to \$29,000 in years 2 and 3. Since there was minimal variability across organizations regarding training, this cost has not been risk-adjusted.

TABLE 10
Training Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
I1	Number of FTEs to attend training sessions		20	210	300	
I2	Average training hours per FTE		16	2	2	
I3	Average hourly fully loaded compensation		\$48	\$48	\$48	
It	Training costs	I1*I2*I3	\$15,360	\$20,160	\$28,800	\$0

Source: Forrester Research, Inc.

Total Costs

Table 11 shows the total of all costs as well as associated present values, discounted at 10%. Over three years, the composite organization expects risk-adjusted total costs to be a present value of a little less than \$2.9 million.

TABLE 11
Total Costs (Risk-Adjusted)

Ref.	Cost Category	Initial	Year 1	Year 2	Year 3	Total	Present Value
Gtr	WAS Liberty license and support costs	\$0	\$1,446,900	\$802,200	\$367,500	\$2,616,600	\$2,254,447
Htr	Internal resource time on migrations	\$70,656	\$393,576	\$154,008	\$0	\$618,240	\$555,732
Itr	Training costs	\$15,360	\$20,160	\$28,800	\$0	\$64,320	\$57,489
	Total costs (risk-adjusted)	\$86,016	\$1,860,636	\$985,008	\$367,500	\$3,299,160	\$2,867,668

Source: Forrester Research, Inc.

FLEXIBILITY

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for some future additional investment. This provides an organization with the “right” or the ability to engage in future initiatives but not the obligation to do so. There are multiple scenarios in which a customer might choose to migrate to WAS Liberty and later realize additional uses and business opportunities. Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix B).

One of the key outcomes from migrating to WAS Liberty is that the organization’s applications and infrastructure, as well as development processes, are more agile. This not only improves time-to-market for new applications and new features, which can generate their own impact, but it also enables the organization to consider moving its applications to the cloud and consider other next-generation applications.

RISKS

Forrester defines two types of risk associated with this analysis: “implementation risk” and “impact risk.” Implementation risk is the risk that a proposed investment in WAS Liberty may deviate from the original or expected requirements, resulting in higher costs than anticipated. Impact risk refers to the risk that the business or technology needs of the organization may not be met by the investment in WAS Liberty, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

TABLE 12

Benefit And Cost Risk Adjustments

Benefits	Adjustment
Deployment time savings	↓ 5%
Server startup time savings	↓ 5%
Application development efficiencies	↓ 10%
Administration efficiencies	↓ 10%
Open source support cost savings	↓ 10%
Infrastructure cost savings	↓ 10%
Costs	Adjustment
WAS Liberty license and support costs	↑ 5%
Internal resource time on migrations	↑ 15%

Source: Forrester Research, Inc.

Quantitatively capturing implementation risk and impact risk by directly adjusting the financial estimates results provides more meaningful and accurate estimates and a more accurate projection of the ROI. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates. The risk-adjusted numbers should be taken as “realistic” expectations since they represent the expected values considering risk.

The following impact risks that affect benefits are identified as part of the analysis:

- › Efficiency benefits are directly affected by the level of adoption by developers and administrators. This includes increasing familiarity with the Liberty platform over time, the use of new tools and features, and the ability to automate processes to achieve time savings. Efficiency benefits are also dependent on the prior state.
- › The benefits are affected by the pace of migration of applications from open source to Liberty. Forrester has assumed a 1.5-year steady migration effort.
- › Open source support contract savings will be dependent on the details of the support contracts in the prior state (such as the level of support, discounts, and vendor cost differences) and the pace of migration.
- › Infrastructure cost savings will be dependent on the prior state and the ability to achieve higher resource utilization and consolidation with Liberty.

The following implementation risks that affect costs are identified as part of this analysis:

- › Software license costs are variable from organization to organization and are dependent on a number of factors, including cost formula variables and vendor discounts.
- › Time spent on application migration will vary from organization to organization, depending on the number of employees dedicated to migrating applications and the size and complexity of applications, among other factors.

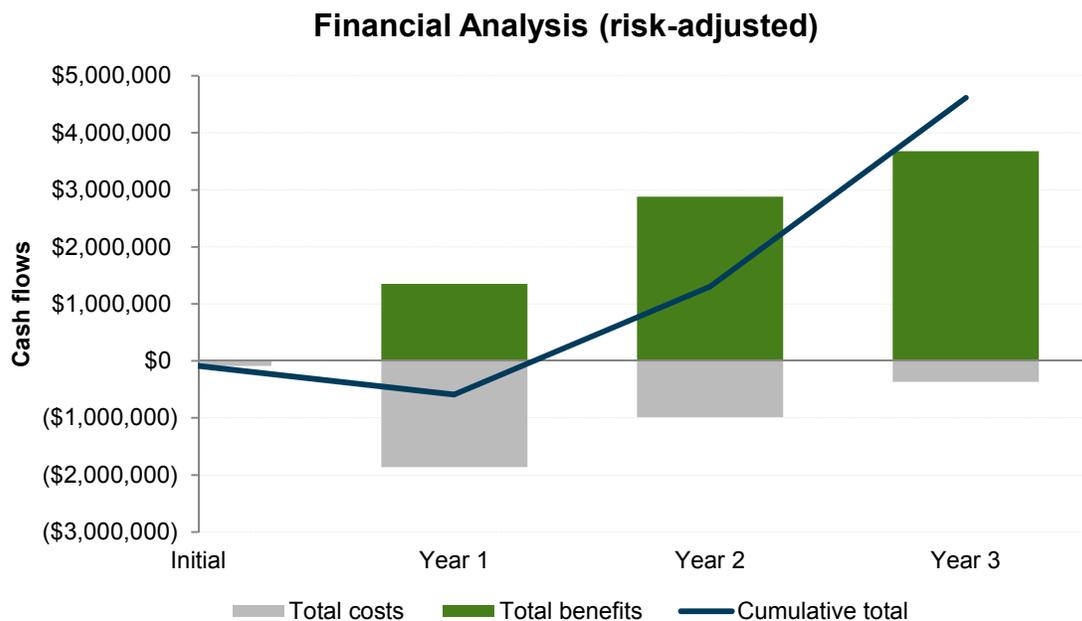
Table 12 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates for the composite organization. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Financial Summary

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 in WAS Liberty.

Table 13 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 12 in the Risks section to the unadjusted results in each relevant cost and benefit section.

FIGURE 3
Cash Flow Chart (Risk-Adjusted)



Source: Forrester Research, Inc.

TABLE 13
Cash Flow (Risk-Adjusted)

	Initial	Year 1	Year 2	Year 3	Total	Present Value
Costs	(\$86,016)	(\$1,860,636)	(\$985,008)	(\$367,500)	(\$3,299,160)	(\$2,867,668)
Benefits	\$0	\$1,353,937	\$2,879,549	\$3,680,436	\$7,913,922	\$6,375,810
Net benefits	(\$86,016)	(\$506,699)	\$1,894,541	\$3,312,936	\$4,614,762	\$3,508,142
ROI						122%
Payback period						15.8 months

Source: Forrester Research, Inc.

IBM WebSphere Application Server Liberty: Overview

The following information is provided by IBM. Forrester has not validated any claims and does not endorse IBM or its offerings.

WebSphere Liberty is a fast, dynamic, easy-to-use Java EE application server. It is ideal for developers but also ready for production, on-premises or in the cloud.

Liberty is a combination of IBM technology and open source software, with fast startup times (less than 2 seconds), no server restarts to pick up changes, and a simple XML configuration. It's all in a package (with Java EE 7 Web Profile) that's less than 60 MB to download. You can be developing applications in no time.

With a flexible, modular runtime, you can download additional features from the Liberty Repository or strip it back to the bare essentials for deployment into production environments. Everything in Liberty is designed to help you get your job done how you want to do it.

We know that integrating Liberty into your development environment is important, so you'll find we integrate with other frameworks like Docker, Chef, Puppet, Jenkins, and UrbanCode Deploy, to name a few, all of which you can find out more about from the developer community and here on WASdev.net.

JAVA EE

WAS Liberty supports Java EE 7 Full Platform in both development and production.

Liberty also continues to support Java EE 6 Web Profile. Any Java EE 6 applications you write on Liberty can be deployed in production, without changes, on Liberty or on IBM WebSphere Application Server traditional.

Appendix A: Composite Organization Description

For this TEI study, Forrester has created a composite organization to illustrate the quantifiable benefits and costs of migrating from open source application servers to WAS Liberty. The composite is intended to represent an organization with \$5.7 billion in revenue and 33,000 employees and is based on characteristics of the interviewed and surveyed customers.

Prior to WAS Liberty, the composite organization had 35 applications running on open source Java EE application servers, as well as other applications on WAS. With the open source application servers, the organization had difficulty scaling applications, slow application startup and a larger footprint due to less flexible configuration, inefficiencies in application development and management due to missing tool sets and lack of automation, and high open source support costs. In migrating to WAS Liberty, the composite organization has the following objectives:

- › Streamline development activities with automation and more current developer tools. Right-size application servers for rapid deployment. Overall, improve development agility and responsiveness to the business to enhance existing applications, and develop new applications to increase competitiveness in the market.
- › Reduce costs by eliminating open source support contracts and reducing the footprint of applications.
- › Standardize on next-generation infrastructure that enables the organization to better pursue cloud and mobile applications.

For the purpose of the analysis, Forrester assumes that the composite organization is able to migrate a majority of its applications to Liberty by the end of Year 1 and all of its applications by Year 2, eliminating support costs for open source platforms. Forrester assumes that, on average, these 35 applications each require 12 Liberty servers and two physical servers, and that over time the organization is able to consolidate with Liberty to achieve hardware and software savings. Forrester also assumes that the organization is able to get high developer and administrator adoption of key Liberty features and tools. New applications developed on Liberty over this time are not included as part of this ROI analysis.

FRAMEWORK ASSUMPTIONS

Table 14 provides the model assumptions that Forrester used in this analysis.

The discount rate used in the PV and NPV calculations is 10%, and the time horizon used for the financial modeling is three years. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with their respective company's finance department to determine the most appropriate discount rate to use within their own organizations.

TABLE 14

Model Assumptions

Ref.	Metric	Calculation	Value
X1	Hours per week		40
X2	Weeks per year		52
X3	Hours per year (M-F, 9-5)		2,080
X4	Hours per year (24x7)		8,736
X5	Annual fully loaded compensation		\$100,000
X6	Hourly	(X5/X3)	\$48

Source: Forrester Research, Inc.

Appendix B: Total Economic Impact™ Overview

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. TEI assists technology vendors in winning, serving, and retaining customers.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, flexibility, and risks.

BENEFITS

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often, product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place 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. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

COSTS

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the form of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

FLEXIBILITY

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprisewide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point. However, having the ability to capture that benefit has a PV that can be estimated. The flexibility component of TEI captures that value.

RISKS

Risks measure the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: 1) the likelihood that the cost and benefit estimates will meet the original projections and 2) the likelihood that the estimates will be measured and tracked over time. TEI risk factors are based on a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the risk factor around each cost and benefit.

Appendix C: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Companies set their own discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their respective organizations to determine the most appropriate discount rate to use in their own environment.

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.

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.

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.

Return on investment (ROI): A measure of a project's expected return in percentage terms. ROI is calculated by dividing net benefits (benefits minus costs) by costs.

A NOTE ON CASH FLOW TABLES

The following is a note on the cash flow tables used in this study (see the example table below). The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1. Those costs are not discounted. All other cash flows in years 1 through 3 are discounted using the discount rate (shown in the Framework Assumptions section) at the end of the year. PV calculations are calculated for each total cost and benefit estimate. NPV calculations are not calculated until 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.

TABLE [EXAMPLE]

Example Table

Ref.	Metric	Calculation	Year 1	Year 2	Year 3

Source: Forrester Research, Inc.