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Prepared for Red Hat

November 19, 2009

Total Economic Impact™ Of Red Hat JBoss Enterprise Application Platform

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Executive Summary

In August 2009, Red Hat commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying JBoss Enterprise Application Platform. JBoss Enterprise Application Platform includes open source technologies for building, deploying, and hosting enterprise Java applications and services. This study illustrates the financial impact of implementing JBoss Enterprise Application Platform for mission-critical applications by an organization that provides integrated voice and data communications.

Forrester found that the organization reduced its operating costs by cutting spending on annual maintenance and support for its Java platform and improved its IT productivity, resulting in shorter product-introduction times and increased revenue.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of JBoss Enterprise Application Platform on their organizations. Forrester clearly shows all calculations and assumptions used in the analysis. Readers should use this study to better understand and communicate a business case for investing in Red Hat's JBoss Enterprise Application Platform.

Methodology

Red Hat selected Forrester for this project because of its industry expertise in the market for open source middleware for the enterprise and Forrester's Total Economic Impact™ (TEI) methodology. TEI not only measures costs and cost reduction (areas that are typically accounted for within IT) but also weighs the enabling value of a technology in increasing the effectiveness of overall business processes.

For this study, Forrester employed four fundamental elements of TEI in modeling JBoss Enterprise Application Platform:

1. Costs and cost reduction
2. Benefits to the entire organization
3. Risk
4. Flexibility

Given enterprises' increasing sophistication regarding cost analyses related to IT investments, Forrester's TEI methodology serves an extremely useful purpose by providing a complete picture of the total economic impact of purchase decisions. Please see Appendix A for additional information on the TEI methodology.

Approach

Forrester used a four-step approach for this study:

1. Forrester gathered data from existing Forrester research about JBoss Enterprise Application Platform and the enterprise middleware market in general.
2. Forrester interviewed Red Hat's marketing and sales personnel to fully understand the potential (or intended) value proposition of JBoss Enterprise Application Platform solutions.
3. Forrester conducted a series of in-depth interviews with an organization currently using Red Hat's JBoss Enterprise Application Platform solutions.

4. Forrester constructed a financial model representative of the interviews. This model can be found in the TEI Framework section below.

Key Findings

Forrester's key findings are summarized in the following:

- **ROI.** Based on the interviews with the subject organization, Forrester constructed a TEI framework to measure its ROI from the JBoss Enterprise Application Platform. As seen in Table 1, the risk-adjusted ROI for our interviewed company is 63% with a breakeven point (payback period) of 19 months after deployment.
- **Benefits.** The organization that we interviewed implemented JBoss Enterprise Application Platform to reduce IT operational costs associated with the maintenance of core applications. In addition, the organization improved IT staff productivity, reducing the time required to bring new products to market and increasing net revenue. The present value (PV) of the risk-adjusted total benefits is equal to \$2,340,926.
- **Costs.** The cost to implement JBoss Enterprise Application Platform includes annual Premium Support and Network Monitoring, training, planning, discovery, implementation, and ongoing maintenance and support costs. The PV of the risk-adjusted total costs equates to \$1,434,509. In these calculations, Forrester employed Red Hat's list prices; normally, discounts of varying levels will apply.

Table 1 illustrates the risk-adjusted cash flow for the subject organization, based on data and characteristics obtained from extensive interviews. Forrester risk-adjusts these values to take into account the potential uncertainty in estimating the costs and benefits of any technology investment. The risk-adjusted value is meant to provide a conservative estimation, incorporating potential implementation and business-impact risk factors that may later affect the original cost and benefit estimates.

Table 1: Financial Results Summary

Summary financial results	Original estimate	Risk-adjusted
ROI	76%	63%
Payback period (months)	18	19
Total costs (PV)	(\$1,385,919)	(\$1,434,509)
Total benefits (PV)	\$2,443,538	\$2,340,926
Total (NPV)	\$1,057,619	\$906,417

Source: Forrester Research, Inc.

For example, similar to most application migrations, Forrester found that the subject organization needed to involve a number of developers when replacing its prior Java infrastructure with the JBoss Enterprise Application Platform. This replacement and migration effort involved additional IT support costs during the initial phase of the implementation. The increase in the number of developers increased the upfront IT support costs, which reduced the overall ROI.

For a more in-depth explanation of risk and risk adjustments used in this study, please see the Risk section.

Disclosures

The reader should be aware of the following facts about this study:

- The study was commissioned by Red Hat and delivered by the Forrester Consulting group.
- Red Hat reviewed Forrester's analysis and provided feedback, but Forrester retained editorial control over the study and its findings. As a policy, Forrester does not accept changes to the study that either contradict Forrester's research findings or obscure the meaning of those findings.
- The customer name for the interview was provided by Red Hat.
- Forrester makes no assumptions about 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 Red Hat's JBoss Enterprise Application Platform.
- This study is not an analysis of competing products. To compare competing products, readers should conduct their own analyses employing the framework provided in this study.

JBoss Enterprise Application Platform: Overview

JBoss Enterprise Application Platform is a component of the JBoss Enterprise Middleware solution. The platform is based on the JBoss Application Server, which provides the Java Enterprise Edition application programming interfaces (APIs) and specifications. On this foundation, the platform also provides customers with clustering, caching, messaging, transaction processing, and a Web services stack.

Over the last year, Red Hat customers have been standardizing on the current Application Platform 4.3 release. In early November, the next major release, JBoss Enterprise Application Platform 5 was made generally available.

Red Hat also offers development and management tools. The subject organization uses JBoss Operations Network, which provides infrastructure and application management features¹.

¹ For additional information, visit <http://www.redhat.com/about/news/prarchive/2009/java-application-platform-products.html>

Analysis

Forrester took a multistep approach to evaluate the impact that implementing JBoss Enterprise Application Platform can have on an organization, including:

- Interviews with Red Hat marketing, sales, and support management.
- In-depth interviews with representatives in an organization that is currently using JBoss Enterprise Application Platform. The organization provides integrated voice and data communications and owns the largest broadband network in US.
- Construction of a financial framework to measure the costs and benefits of an implementation of JBoss Enterprise Application Platform, using the subject organization's experience as a foundation.

Interview Highlights

The company that is the subject of this study is the provider of an integrated voice and data communication network that is used by large telecommunication providers. The telecommunication companies rebrand the organization's services before selling them to customers. The organization's operation support system (OSS) facilitates the ordering and billing processes of the subject organization, taking into account the intermediary partner relationships. About 80% of transactions are automated.

Forrester's interviews with the director of software architecture and delivery revealed:

- The subject organization adopted JBoss Enterprise Application Platform to reduce IT costs and improve systems quality, reduce time-to-market for new products, grow its application portfolio with minimal increase in IT capital expenses and IT staff, and eliminate vendor lock-ins.
- The organization's technology goals were to simplify the architecture of its business and network operating systems (core applications), improve system uptime, ensure seamless porting of applications across platforms to minimize downtime and disruption for the end users, and embrace new technologies and architectural standards.
- To meet these general management and IT goals, the subject organization decided to reduce its software maintenance and support costs and switch from a conventional platform licensing model to an open-source model. The organization believed that the licensing terms of its incumbent Java platform vendor had become prohibitively expensive. After a series of product evaluations, the team settled on JBoss as its open-source application platform provider.
- In addition to allowing the organization to meet its management and technology goals, JBoss yielding greater productivity in database interaction coding, the ability to select optimal Web services kits, and deep monitoring and control of the stack. JBoss's integration with the Hibernate database access layer made coding faster and reduced the time required to test this aspect of the organization's applications. The organization now deploys different Web services stacks for different needs, optimizing performance depending on the situation. Lastly, the organization has found the JBoss Operations Network (JON) to provide deep visibility into the stack's operations – as part of the standard subscription.

TEI Framework

Introduction

From the information provided in extensive interviews and model reviews, Forrester constructed a TEI framework for organizations considering implementation of JBoss Enterprise Application Platform and analyzed the subject organization's experience using that model. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that impact the investment decision.

Framework Assumptions

Table 2 lists the discount rate used in the PV and net present value (NPV) calculations and time horizon used for the financial modeling.

Table 2: General Assumptions

General assumptions	Value
Discount rate	10%
Length of analysis	Three years

Source: Forrester Research, Inc.

Organizations typically use discount rates between 8% and 16% based on their current environment.² Readers are urged to consult with their finance departments to determine the most appropriate discount rate to use within their own organizations.

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used within this analysis. (These numbers have been rounded throughout the study.)

Table 3: Salary Assumptions

Ref.	Metric	Calculation	Value
A1	Hours per week		40
A2	Weeks per year		52
A3	Hours per year	A1*A2	2,080
A4	Annual fully loaded salary for midlevel developers		\$90,000
A5	Hourly salary	(A4/A3)	\$43

Source: Forrester Research, Inc.

² This represents the interest rate used in cash flow analysis to take into account the time value of money.

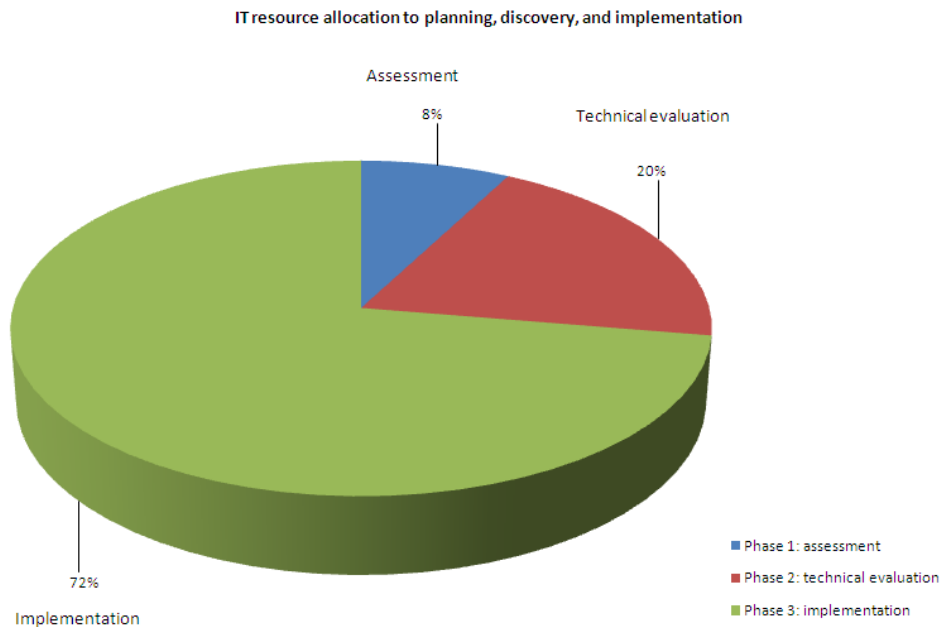
Costs

This section outlines the investment made by the subject organization in the JBoss Enterprise Application Platform. The subject organization divided its people and their time into three project phases: assessment and planning, technical preparation, and implementation. In addition to the time and effort prior to and during the implementation phase, we also considered Premium Support and Network Operation Monitoring fees and ongoing maintenance and support costs to manage JBoss and phase out the legacy platform.

Planning, Technical Assessment, And Implementation.

This section describes the time and effort required for implementation of the JBoss solution, which accounted for 46% of the overall investment. The subject organization allocated 8% of its resources to Phase 1, 20% to Phase 2, and 72% to Phase 3. Figure 1 presents the allocation of resources.

Figure 1: Distribution Of Resources From Planning Through Implementation



Source: Forrester Research, Inc.

The pre-implementation costs are one-time, upfront expenses to assess technical requirements and estimate resources necessary to move forward with the implementation. During the pre-implementation phase, the organization did not purchase licenses, but instead used a free trial version.

During the assessment and planning period (Phase 1), the subject organization addressed a series of questions to facilitate the migration:

- Is our organization ready for open source? Determine if our usage scenarios are in compliance with JBoss legal terms and that we have the necessary skills.

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- What is the total cost of ownership (TCO)? Determine if the existing apps are J2EE-compliant and to what extent we will use proprietary features.
- What is the best path for migration? Identify required skills, in-house vendors, and JBoss professional services; determine upgrade or migrate road map; and select either one-shot launch or phased migration.

Based on the interviews, two managers, one key architect, and two senior-level developers allocated 30% of their time for three months during this phase. Table 4 presents this calculation.

Table 4: Pre-implementation (Phase 1) Labor Effort

Ref.	Metric	Value
B1	Annual fully loaded salary for managers	\$170,000
B2	Total managers	2
B3	Annual fully loaded salary for key architects	\$150,000
B4	Total architects	1
B5	Annual fully loaded salary for senior developers	\$130,000
B6	Total senior developers	2
B7	Percentage participation	30%
B8	Number of months	3
Bt	Pre-implementation (Phase 1) labor effort $\{(B1*B2+B3*B4+B5*B6) / 12 \text{ (number of months per year)} * B7*B8\}$	\$56,250

Source: Forrester Research, Inc.

During Phase 2, the organization analyzed and designed the migration road map, identified challenges prior to migration, utilized features of the new platform, used JBoss migration resources and tools, developed in-house skills for execution and maintenance, and planned for ongoing management after implementation. Two managers, two key architects, two senior-level developers, and two midlevel developers allocated 40% of their time for four months during this phase. Table 5 illustrates this calculation.

Table 5: Pre-implementation (Phase 2) Labor Effort

Ref.	Metric	Value
C1	Annual fully loaded salary for managers	\$170,000
C2	Total managers	2
C3	Annual fully loaded salary for key architects	\$150,000
C4	Total key architects	2
C5	Annual fully loaded salary for senior developers	\$130,000
C6	Total senior developers	2
C7	Annual fully loaded salary for midlevel developers	\$90,000
C8	Total midlevel developers	2
C9	Percentage participation	40%
C10	Number of months	4
Ct	Pre-implementation (Phase 2) labor effort $\{(C1 * C2 + C3 * C4 + C5 * C6 + C7 * C8) / 12 \text{ (number of months per year)} * C9 * C10\}$	\$144,000

Source: Forrester Research, Inc.

The organization did also invest in training costs during Phase 1 and Phase 2 prior to implementation to identify challenges and exploit newly acquired JBoss features. Table 6 demonstrates this calculation.

Table 6: Pre-implementation (Phase 2) Labor Effort

Ref.	Metric	Calculation	Initial
D1	Phase 1 costs		\$56,250
D2	Phase 2 costs		\$144,000
D3	Training costs for Phases 1 and 2		\$15,000
Dt	Pre-implementation costs: planning and discovery	D1+D2+D3	\$215,250

Source: Forrester Research, Inc.

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Phase 3 was the final stage where the organization installed, tested, and rolled out the solution. The required time and effort for the development team is presented in the table below. During the five months, a team of two management-level staff members, two key architects, eight senior-level developers, seven midlevel developers, and eight quality assurance (QA) staff members allocated 40% of their time to these activities. Table 7 presents this calculation.

Table 7: Internal Implementation Costs

Ref.	Metric	Value
E1	Annual fully loaded salary for managers	\$170,000
E2	Total managers	2
E3	Annual fully loaded salary for key architects	\$150,000
E4	Total architects	2
E5	Annual fully loaded salary for senior developers	\$130,000
E6	Total senior developers	8
E7	Annual fully loaded salary for midlevel developers	\$90,000
E8	Total midlevel developers	7
E9	Annual fully loaded salary for QA staff members	\$105,000
E10	Total number of QA staff members	8
E11	Percentage participation	40%
E12	Number of months	5
Et	Implementation (Phase 3) labor effort $\{(E1 * E2 + E3 * E4 + E5 * E6 + E7 * E8 + E9 * E10) / 12$ (number of months per year) * E11 * E12}	\$525,000

Source: Forrester Research, Inc.

Our interviewee explained that 85% of the total implementation effort took place in Year 1, 10% took place in Year 2, and 5% took place in Year 3. Table 8 illustrates this calculation.

Table 8: Internal Implementation Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
F1	Total implementation cost		\$525,000				
F2	Percent distribution		0%	85%	10%	5%	
Ft	IT effort associated with software migration	F1*F2	\$0	\$446,250	\$52,500	\$26,250	\$525,000

Source: Forrester Research, Inc.

Vendor Costs

This cost represents 15% of the overall investment. For the JBoss open source solution, the organization obtained subscriptions for maintenance and support according to JBoss' standard model. The subject organization pays \$45,000 per year for a Premium Support contract and \$16,000 annually for a Network Operation Monitoring subscription. Both fees reflect the organization's CPU count of 32. The training cost is paid depending on the organization's need. The organization spent \$30,000 on training costs for its IT staff during the initial phase of implementation, and \$15,000 and \$10,000 in Years 2 and 3, respectively. Table 9 illustrates this calculation.

Table 9: Vendor Costs – Annual Subscription

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
G1	Premium Support Subscriptions		\$45,000	\$45,000	\$45,000	\$135,000
G2	Network Operation Monitoring Subscriptions		\$16,000	\$16,000	\$16,000	\$48,000
G3	Annual training		\$30,000	\$15,000	\$10,000	\$55,000
Gt	JBoss Enterprise Application Platform total costs	G1+G2+G3	\$91,000	\$76,000	\$71,000	\$238,000

Source: Forrester Research, Inc.

Administrative Effort For Ongoing Management Costs

The final category of costs is the administrative effort associated with ongoing maintenance and support. This category represents 39% of the total cost and includes JBoss ongoing management effort as well as the legacy platform maintenance prior to migration.

During Phase 3, the migration team was primarily responsible for moving applications from the legacy platform to JBoss. However, to ensure that users would not experience any disruption in service, it was essential to continue ongoing management of the legacy system.

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In Table 10, based on the customer interviews, we are estimating the costs of maintaining the legacy system for six months while migrating to the JBoss platform. The organization was able to eliminate software support and maintenance fees for the second half of the year. This savings will be presented in the next section under the support and maintenance cost avoidance benefit category.

Two midlevel developers, three system administrators, and one system architect make up the maintenance and support team. During Year 1 (the deployment phase), midlevel administrators and system administrators spent 13% of their time on legacy platform maintenance and 13% on JBoss maintenance. In the same phase, the system architect spent 4% of his time on legacy platform maintenance and 4% on JBoss maintenance.

The Year 1 ongoing administrative effort is equally divided between legacy platform and JBoss, each presenting 50% of \$123,750 or \$61,875. After rollout during Years 2 and 3, the midlevel developers, system administrators, and system architect will allocate 50%, 50%, and 15%, respectively, to ongoing system maintenance and management. Table 10 presents this calculation.

Table 10: Ongoing Administrative Support And Maintenance

Ref.	Metric	Year 1	Year 2	Year 3	Total
H1	Number of midlevel developers	2	2	2	
H2	Percentage of time contributed annually (legacy platform)	13%	0%	0%	\$22,500
H3	Percentage of time contributed annually (JBoss)	13%	50%	50%	\$202,500
H4	Annual fully loaded salary for midlevel developers	\$90,000	\$90,000	\$90,000	
H5	Number of system administrators	3	3	3	
H6	Percentage of time contributed annually (legacy platform)	13%	0%	0%	\$33,750
H7	Percentage of time contributed annually (JBoss)	13%	50%	50%	\$303,750
H8	Annual fully loaded salary for system administrators	\$90,000	\$90,000	\$90,000	
H9	Number of system architects	1	1	1	
H10	Percentage of time contributed annually (legacy platform)	4%	0%	0%	\$5,625
H11	Percentage of time contributed annually (JBoss)	4%	15%	15%	\$50,625
H12	Annual fully loaded salary for system architects	\$150,000	\$150,000	\$150,000	
Ht	Ongoing administrative support and maintenance H1*(H2+H3)*H4+H5*(H6+H7)*H8+H9*(H10+H11)*H12	\$123,750	\$247,500	\$247,500	\$618,750

Source: Forrester Research, Inc.

Total Costs

Table 11 illustrates the total costs of implementing JBoss Enterprise Application Platform for the interviewed organization.

Table 11: Total Costs (Non-Risk-Adjusted)

Costs	Initial	Year 1	Year 2	Year 3	Total	PV
Pre-implementation costs	(\$215,250)				(\$215,250)	(\$215,250)
IT effort for software migration		(\$446,250)	(\$52,500)	(\$26,250)	(\$525,000)	(\$468,792)
JBoss annual subscription		(\$91,000)	(\$76,000)	(\$71,000)	(\$238,000)	(\$198,881)
Ongoing administrative support and maintenance*		(\$123,750)	(\$247,500)	(\$247,500)	(\$618,750)	(\$502,996)
Total costs	(\$215,250)	(\$661,000)	(\$376,000)	(\$344,750)	(\$1,597,000)	(\$1,385,919)

The Year 1 ongoing administrative effort is equally divided between legacy platform and JBoss, each presenting 50% of \$123,750 or \$61,875.

Source: Forrester Research, Inc.

Benefits

The next component of the analysis examines the benefits associated with the investment in JBoss Enterprise Application Platform. The organization interviewed was able to quantify a series of IT and business benefits, including a reduction in ongoing IT maintenance and support fees, improved IT productivity, and an improvement in revenue.

Costs Savings From Maintenance and Support Fees

Savings on licensing, maintenance, and support costs for the prior Java platform account for 69% of the overall benefits. The simplification exercise that enabled the team to create virtual boxes out of big powerful boxes led to the reduction of application platform licenses by 75%.

The event that precipitated the switch to JBoss was the decision to use virtualized Solaris servers as the foundation for the organization’s Java applications.³ This strategy cut server sprawl and helped reduce by 75% of the total application server licenses required to run the organization’s applications. However, the incumbent vendor insisted on continued maintenance and support charges for the now-unused licenses. JBoss licenses, maintenance, and support fees are tied to CPUs, which allowed the subject organization to capture the savings opportunity created by its new hardware strategy.

At peak, the subject organization paid \$750,000 in maintenance and support fees alone for its Java application platform. This fee was also subject to an annual increase of 10%. The subject

³ The subject organization used Solaris’ Zone technique to create virtual servers on several large physical servers.

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organization was able to eliminate 50% of Year 1 fees (savings of \$375,000) as well as 100% of Year 2 and Year 3, which included the projected additional price increase.

The savings for Year 2 and Year 3 equates to \$825,000 and \$907,500 respectively. Table 12 presents this calculation.

Table 12: Reduced IT Operational fees

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
I1	Saved maintenance and support fees		\$750,000			
I2	Percentage cost increase annually		0%	10%	10%	
I3	Percentage captured		50%	100%	100%	
It	Reduced IT operational costs – maintenance and support costs	$I1*(1+I2)*I3$	\$375,000	\$825,000	\$907,500	\$2,107,500

Source: Forrester Research, Inc.

IT Productivity Gain

This benefit presents 22% of the overall gain. The subject organization realized these gains by using JBoss Hibernate to automate creation of the database interfaces for its applications and JBoss jBPM to automate a new “continuous integration” application development life cycle. Both steps allow development teams to deliver applications faster. The organization hopes to achieve an additional productivity gain from JBoss Rules.

After implementation of JBoss, 40 developers were able to improve their productivity by 15%. As they became comfortable with the new capabilities, the productivity gains increased starting at 5% in Year 1, 10% in Year 2, and 15% in Year 3. To avoid an overly aggressive finding, Forrester assumes that the organization can only utilize 50% of the productivity gain. This gain translates to \$110,000 in Year 1, \$220,000 in Year 2, and \$330,000 in Year 3 (number of developers*average annual fully loaded salary*improvement in productivity*percentage captured). Table 13 illustrates the equation.

Table 13: IT Productivity Gain

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
J1	Number of developers		40			
J2	Average annual fully loaded salary		\$110,000			
J3	Improvement in productivity		5%	10%	15%	
J4	Percentage captured		50%	50%	50%	
Jt	IT productivity gain	$J1*J2*J3*J4$	\$110,000	\$220,000	\$330,000	\$660,000

Source: Forrester Research, Inc.

Incremental Gross Revenue

As IT productivity gained, the developers were able to complete products faster and shorten the time-to-market for products. Improvement in time-to-market for this transactional organization led to some quantifiable increase in revenue. Our interviewee explained that the organization was able to launch products two months earlier than previously estimated. With annual net revenue of \$1 million, the organization estimates monthly revenue of \$83,333. To remain conservative, we assumed that the company realized only 10% of the benefit in Year 1, 50% in Year 2, and 100% in Year 3. This benefit presents 9% of the overall gain. Table 14 presents these equations.

Table 14: Incremental Gross Revenue

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total
K1	Average annual revenue		\$1,000,000			
K2	Number of months per year		12			
K3	Average monthly revenue	K1/K2	\$83,333			
K4	Number of months reduced when product time-to-market was shortened		2			
K5	Percentage captured		10%	50%	100%	
Kt	Incremental revenue	$K3 * K4 * K5 * K6$	\$16,667	\$83,333	\$166,667	\$266,667

Source: Forrester Research, Inc.

Total Benefits

Table 15 presents the total benefits resulting from the implementation of JBoss Enterprise Application Platform for the representative customer.

Table 15: Total Benefits – (Non-Risk-Adjusted)

Benefits	Year 1	Year 2	Year 3	Total	PV
Direct cost avoidance	\$375,000	\$825,000	\$907,500	\$2,107,500	\$1,704,545
IT productivity gain – improvement in product time-to-market	\$110,000	\$220,000	\$330,000	\$660,000	\$529,752
Incremental gross revenue	\$16,667	\$83,333	\$166,667	\$266,667	\$209,241
Total benefits	\$501,667	\$1,128,333	\$1,404,167	\$3,034,167	\$2,443,538

Source: Forrester Research, Inc.

Risk

Risk is the third component within the TEI model; it is used as a filter to capture the uncertainty surrounding any and all cost and benefit estimates. The risk-adjusted numbers should be taken as “realistic” expectations because they represent the expected values considering risk. In general, risks affect costs by raising the original estimates, and they affect benefits by reducing the original estimates. Quantitatively capturing investment risk by directly adjusting the financial estimates results in a more meaningful and accurate projection of the ROI.

Forrester defines two types of investment risk associated with this analysis: implementation and impact risk.

- **Implementation risk.** Implementation risk is the risk that a proposed technology investment may deviate from the original resource requirements needed to implement and integrate the investment, resulting in higher costs than anticipated.
- **Impact risk.** Impact risk refers to the risk that the business or technology needs of the organization may not be met by the technology investment, resulting in lower overall benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points.⁴

The following general management and process risk was considered in this study:

- Similar to any application migrations, organizations that are planning to implement JBoss Enterprise Application Platform may require additional IT staff time and effort depending on their infrastructure, the level of process redesign needed, and the in-house skill set required.

The following risk specific to JBoss Enterprise Application Platform was considered in this study:

- The operational cost savings resulting from phasing out a conventional platform may vary depending on the scale of implementation. Transactional organizations may need to overlap solutions, maintaining their existing solution for a short period while the new JBoss-based solution comes on line. This helps ensure there is no failure in services offered.

The following tables show the values used to adjust for uncertainty in cost and benefit estimates. Different cost and benefit estimates have different levels of risk adjustments. Based on the comments from the interviewed customer, we applied risk to a number of cost and benefit categories to adjust for any uncertainty. Forrester used list prices for all software licensing and maintenance fees. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

⁴ Take the case of IT productivity gain: The \$529,752 value used in this analysis can be considered the “most likely” or expected value. The variability represents a risk that must be captured as part of this study. Forrester uses a risk factor of 100% on the high end, 100% as the most likely, and 50% on the low end for this calculation. This has the effect of increasing the benefit estimate to take into account the fact that original cost estimates are more likely to be revised downward than upward. Forrester then creates a triangular distribution to reflect the range of expected benefits, with 83% as the mean (83% is equal to the sum of 100%, 100%, and 50% divided by three). Forrester applies this mean to the most likely estimate — \$529,752 — to arrive at a risk-adjusted value of \$439,694.

Table 16: Total Costs – Risk-Adjusted

Costs	Initial	Year 1	Year 2	Year 3	Total	PV
Pre-implementation costs	(\$215,250)				(\$215,250)	(\$215,250)
IT effort for software migration		(\$468,563)	(\$55,125)	(\$27,563)	(\$551,250)	(\$492,232)
JBoss annual subscription		(91,000)	(76,000)	(71,000)	(238,000)	(198,881)
Ongoing administrative support and maintenance*		(\$129,938)	(\$259,875)	(\$259,875)	(\$649,688)	(\$528,146)
Total costs	(\$215,250)	(\$689,500)	(\$391,000)	(\$358,438)	(\$1,654,188)	(\$1,434,509)

*The Year 1 ongoing administrative effort is equally divided between legacy platform and JBoss, each presenting 50% of \$129,938 or \$64,969.

Source: Forrester Research, Inc.

Table 17: Total Benefits – Risk-Adjusted

Benefits	Year 1	Year 2	Year 3	Total	PV
Direct cost avoidance	\$375,000	\$825,000	\$907,500	\$2,107,500	\$1,704,545
IT productivity gain – improvement in product time-to-market	\$91,300	\$182,600	\$273,900	\$547,800	\$439,694
Incremental gross revenue	\$15,667	\$78,333	\$156,667	\$250,667	\$196,687
Total benefits	\$481,967	\$1,085,933	\$1,338,067	\$2,905,967	\$2,340,926

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by Forrester’s TEI methodology, represents an investment in additional capacity or capability today that could be turned into future business benefits for some future additional cost. This provides an organization with the “right” or the ability to engage in future initiatives but not the obligation to do so. The value of flexibility is unique to each organization and the willingness to measure its value varies from company to company (described in more detail in Appendix A)

Table 18 illustrates the metrics used to measure Flexibility as described by Forrester. For example, if a customer decides to implement JBoss Enterprise Service Oriented Architecture Platform (SOA) to drive additional benefits, we can estimate the incremental value driven from the new investment. If the following metrics are available: the asset value by measuring the benefits (i.e., costs avoided or saved, revenue generated, and/or capital saved), the costs to acquire the solution, and the number of years to measure the investment. We can estimate the flexibility option by using Black-Scholes option pricing model.

Table 18: Total Benefits – Risk-Adjusted

Metric	Calculation
Asset value (benefit)	IT or business costs avoided, revenue generated, capital saved
Cost to acquire option	Planning and discovery, subscription, annual maintenance are example of costs to consider.
Expiration	Time to expire, in years
Flexibility	Black-Scholes option pricing model

Source: Forrester Research, Inc.

TEI Framework: Summary

Considering the financial framework constructed above, the results of the Costs, Benefits, Risk, and Flexibility sections using the representative numbers can be used to determine ROI, NPV, and payback period. Tables 19 and 20 show the consolidation of the numbers for the organization interviewed.

It is important to note that values used throughout the TEI framework are based on in-depth interviews with an organization. Forrester makes no assumptions as to the potential return that other organizations will receive within their own environment. Forrester strongly advises that readers use their own estimates within the framework provided in this study to determine the expected financial impact of implementing JBoss Enterprise Application Platform.

Table 19: Summary Financial Non-Risk-Adjusted Cash Flow

Categories	Initial	Year 1	Year 2	Year 3	Total	PV
Total costs	(\$215,250)	(\$661,000)	(\$376,000)	(\$344,750)	(\$1,597,000)	(\$1,385,919)
Total benefits		\$501,667	\$1,128,333	\$1,404,167	\$3,034,167	\$2,443,538
Total	(\$215,250)	(\$159,333)	\$752,333	\$1,059,417	\$1,437,167	\$1,057,619
ROI	76%					
Payback period (months)	18					

Source: Forrester Research, Inc.

Table 20: Summary Financial Risk-Adjusted Cash Flow

Categories	Initial	Year 1	Year 2	Year 3	Total	PV
Total costs	(\$215,250)	(\$689,500)	(\$391,000)	(\$358,438)	(\$1,654,188)	(\$1,434,509)
Total benefits		\$481,967	\$1,085,933	\$1,338,067	\$2,905,967	\$2,340,926
Total	(\$215,250)	(\$207,533)	\$694,933	\$979,629	\$1,251,779	\$906,417
ROI	63%					
Payback period (months)	19					

Source: Forrester Research, Inc.

Study Conclusions

The subject organization's experience with JBoss Enterprise Application Platform illustrates the potential benefits available to users of this product suite compared with conventionally licensed Java application platforms:

- Organizations can reduce their license and maintenance/support costs by adopting the JBoss platform. The magnitude of this benefit will depend on the points of comparison with JBoss' products and their costs.
- Organizations may be able to realize developer productivity gains with JBoss Enterprise Application Platform, depending on the components they adopt and the specific points of comparison with their prior development environments. Similar to all software, mere adoption of JBoss Enterprise Application Platform will not guarantee developer productivity gains.
- As is the common case with application migration, organizations may need to involve a number of developers when replacing the legacy platform with JBoss Enterprise Application Platform from conventional middleware. This effort may lead to a rise in initial IT support staff during the opening phase of the implementation. The increase in the number of developers will add to the upfront IT support costs, which in turn will reduce the project ROI.

The financial analysis provided in this study illustrates one way that an organization can evaluate the value proposition of JBoss Enterprise Application Platform. Based on information collected in customer interviews, Forrester calculated a three-year risk-adjusted ROI of 63% for the subject organization with a payback period of 19 months. All final estimates are risk-adjusted to incorporate potential uncertainty in the calculation of costs and benefits.

Based on these findings, companies looking to implement JBoss Enterprise Application Platform can see operational cost savings, possible IT productivity benefits, and an increase in revenue when product time-to-market has improved. Using the TEI framework, many companies may find the potential for a compelling business case to make such an investment.

Appendix A: 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.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility. For the purpose of this analysis, the impact of flexibility was not quantified.

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 forms 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.

Risk

Risk measures the uncertainty of benefit and cost estimates contained within the investment. Uncertainty is measured in two ways: the likelihood that the cost and benefit estimates will meet the original projections and the likelihood that the estimates will be measured and tracked over time. TEI applies a probability density function known as "triangular distribution" to the values entered. At a minimum, three values are calculated to estimate the underlying range around each cost and benefit.

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 in time. However, having the ability to capture that benefit has a present value that can be estimated. The flexibility component of TEI captures that value.

Appendix B: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Although the Federal Reserve Bank sets a discount rate, companies often set a 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 organization 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 an interest rate (the discount rate). The PV of costs and benefits feed into the total net present value of cash flows.

Payback period: The breakeven point for an investment. 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 Table 1 at the end of the year. Present value (PV) calculations are calculated for each total cost and benefit estimate. Net present value (NPV) calculations are not calculated until the summary tables and are the sum of the initial investment and the discounted cash flows in each year.

Example Table

Ref.	Category	Calculation	Initial cost	Year 1	Year 2	Year 3	Total

Source: Forrester Research, Inc.