The Total Economic Impact Of IBM System z

Project Team: Michelle S. Bishop and Jon Erickson

April 2012

TABLE OF CONTENTS

About Forrester Consulting
Forrester Consulting provides independent and objective research-based consulting to help leaders succeed in their organizations. Ranging in scope from a short strategy session to custom projects, Forrester's Consulting services connect you directly with research analysts who apply expert insight to your specific business challenges. For more information, visit www.forrester.com/consulting.

Executive Summary

Applications represent three of the top four software concerns of IT executives: 1) 66% cite updating/modernizing key legacy applications as a critical or high priority; 2) 63% cite upgrading packaged applications to a newer release as such; and 3) 55% cite consolidating or rationalizing enterprise applications.[1] Knee-jerk reactions imply that hardware change is a panacea, but organizations should consider the varying nature of their application workloads in order to make smarter platform choices. In the real world, it is not an either-or decision on infrastructure but a thorough evaluation of availability, stability, and agility that will determine the best infrastructure approach for an organization's environment.

In July 2011, IBM commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying IBM System z. Forrester conducted in-depth interviews with executives from five IBM System z customers that have adopted System z as part of their overall application deployment strategy. Forrester then compiled the interview results, including forward-looking expectations, into a composite case study of a 4,500-IT-employee organization. The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of deploying IBM System z within their organizations.

IBM System z Balances Operational Cost And High Performance For Mission-Critical Applications

Total Economic Impact™ (TEI) is a standard methodology developed by Forrester Research that captures and quantifies the voice of the customer relative to technology investments. In this study, we interviewed five IBM customers in one-on-one discussions about each organization's experience in implementing IBM System z. Forrester's interviews and subsequent financial analysis determined that a composite organization, based on the organizations we interviewed, would expect to experience the risk-adjusted ROI, costs, and benefits summarized in Table 1.

Table 1

Composite Organization Three-Year Risk-Adjusted ROI

ROI	Payback period	Total benefits (present value [PV])	Total costs (PV)	Net present value (NPV)
199%	4.67 months	$18,596,273	($6,227,269)	$12,369,004

Source: Forrester Research, Inc.

- **Summary.** Overall this study concludes that the composite organization achieved a three-year present value of **$18,596,273** (risk-adjusted net benefits) as a result of deploying IBM System z for a mission-critical application supporting 4,500 users. The payback period was over four months after implementation.

- **Benefits.** The composite organization achieved the following benefits that represent those experienced by the interviewed companies:

  - **Reduction in server administration staff.** Organizations noted that by having a centralized enterprise environment, they could gain cost-efficiencies among support staff, compared with a

distributed server environment. There were fewer boxes to maintain and reduced need for geographically spread-out staff across multiple sites.

- o **Cost avoidance of maintaining distributed platform infrastructure.** Organizations also noted that by reducing the number of servers across the environment, they were able to reduce the indirect costs of maintaining the infrastructure, specifically around power and cooling within the environment.

- o **Reduced cost of storage.** Another area of capital cost savings was in avoiding the cost of storage in a distributed non-compression-based environment. One organization in particular was able to achieve data compression rates of 68% of its storage environment by moving away from a distributed platform.

- o **Cost savings from reduced downtime.** For many organizations, availability of mission-critical applications was the primary driving benefit in moving away from a distributed environment. Several organizations noted cases in a distributed workload environment where they experienced higher downtime leading to potential regulatory or compliance penalties from the event. Improving the availability of the system reduced the risk of penalties for the organization.

- o **Better flexibility.** Organizations reported that their IT teams were now able to respond faster to business needs and gain flexibility to use additional capacity with their implementation of System z.

- o **Improved business credibility.** Several organizations noted the tie to improving credibility with external stakeholders from increased availability and reliability. For example, an organization with heavy-volume credit card transactions and PCI-compliance requirements noted that its System z implementation improved its credibility with business partners.

- **Costs.** The organizations we interviewed incurred the following costs:

  - o Cost of hardware and storage.

  - o Implementation costs, which may include internal labor costs for planning, design, and implementation as well as professional fees paid to an IBM partner for implementation.

  - o Ongoing administrative support costs.

Factors Affecting Benefits And Costs

Table 1 illustrates the risk-adjusted financial results that would be expected by the composite organization described in Appendix A. The risk-adjusted values take into account potential uncertainty or variance that exists in estimating the costs and benefits, which produces more conservative estimates. The following factors may affect the financial results that an organization may experience:

- The pre-IBM System z environment (the architecture and configuration of the distributed server environment).

- Level of familiarity with System z and storage and network requirements.

- Size and type of mission-critical applications running on System z.

Disclosures

The reader should be aware of the following:

- The study was commissioned by IBM and delivered by the Forrester Consulting group.

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

- 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.

- The customers for the interviews were provided by IBM.
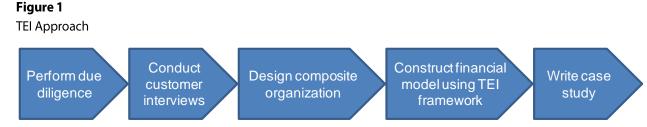
TEI Framework And Methodology

Introduction

From the information provided in the interviews, Forrester has constructed a TEI framework for those organizations considering implementing IBM System z. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. TEI is a standard methodology developed by Forrester Research that enhances an organization's technology decision-making processes.

Approach And Methodology

Forrester took a multistep approach to evaluate the economic impact that IBM System z can have on an organization (see Figure 1). Specifically, we:

- Interviewed IBM marketing, implementation, and sales staff as well as Forrester Research analysts to gather data relative to IBM System z and the infrastructure market in general.

- Interviewed five organizations currently using IBM System z to obtain data with respect to costs, benefits, risk, and flexibility.

- Designed a composite organization based on characteristics of the interviewed organizations (see Appendix A).

- Constructed a financial model representative of the interviews using the TEI methodology. The financial model is populated with the cost and benefit data obtained from the interviews as applied to the composite organization.

Figure 1

TEI Approach

Source: Forrester Research, Inc.

Forrester employed four fundamental elements of TEI in modeling the financial implications of deploying IBM System z:

1. Costs.

2. Benefits to the entire organization.

3. Flexibility.

4. Risk.

Forrester's TEI methodology provides a complete picture of the total economic impact of technology investment decisions. Please see Appendix B for additional information on the TEI methodology.

Analysis

Interview Highlights

A total of five interviews were conducted for this study, involving representatives from the following companies:

1. An electronic technology manufacturer based in North America currently running its global enterprise resource planning (ERP) application on System z and recently having gone through a merger and acquisition resulting in the integration of another global instance of ERP into a single System z platform.

2. A global retailer based in North America running its global ERP solution on System z.

3. A financial institution based in Latin America running its core banking application on System z.

4. An industry leader in business consulting, smart card solutions, e-payment networks, and financial transaction processing systems based in North America running its entire IT infrastructure on System z.

5. A multi-national Scandinavian bank that deployed IBM zEnterprise for web services and CPU reduction for the mainframe.

These interviews uncovered a number of important insights about customer organizations' experience with IBM System z:

-   **Prior environment.** The majority of the organizations interviewed previously had a distributed architecture in place to support their mission-critical application. To manage the growth of the application, these organizations were building on the existing distributed architecture.

-   **Constraints to future growth.** All of the organizations were experiencing rapid growth and had barriers that were hampering the growth of the distributed environment. As the environment grew more distributed, resources to support the environment were growing thin, increasing the likelihood of potential impact on system availability.

-   **Key investment drivers.** Organizations noted several key drivers in the decision to invest in System z for mission-critical applications. These included the need to standardize and consolidate in a complex distributed environment, providing high levels of system availability for mission-critical applications, building in added capacity and flexibility for the growth of applications and data, as well as maintaining and driving cost-efficiency within the environment.

-   **Need to standardize and consolidate.** For many of the organizations interviewed, the decision to move to System z was coupled with an overall initiative to simplify and standardize their IT environment. Over the past several years, organizations saw their increase in TI spend and complexity, with little improvement in the return of that spend to the organization. As a result, organizations we compelled to drive cost-efficiencies by standardizing and consolidating their infrastructure. Organizations that relied on a distributed environment to support their mission-critical applications saw the possibility of operational and cost savings in moving to a consolidated system.

-   **Need to provide high levels of system availability for mission-critical applications.** With the drive to maximize cost-efficiency came the need to maintain high levels of availability in an increasingly complex distributed

environment. Many organizations realized their existing distributed architecture could not provide high levels of availability as the environment grew.

- **Need to build added capacity and flexibility.** The decision to move to a centralized environment provided additional opportunities to scale and realize additional benefits throughout the environment. Several organizations noted savings around reduced server costs as well as greater storage compression by consolidating on a single enterprise device. In addition, the System z architecture made it possible for several organizations to realize longer-term downstream benefits related to data analytics.

- **Investment risks.** Risks associated with migration were mitigated by the ability to quickly migrate system administrators onto the new platform and a clear migration road map from IBM. Several organizations noted their concern of retraining staff from a legacy platform on System z. As a result, organizations generally spent significantly more time planning and preparing for the migration than performing the actual migration itself.

- **Benefits of zEnterprise.** One company that had implemented IBM WebSphere DataPower for zEnterprise cited security, speed and improved flexibility to meet business needs as the main benefits of System z to their financial services organization.

Composite Organization

Forrester constructed a TEI framework, a composite organization, and an associated ROI analysis that illustrates the areas financially affected based on interviews with five IBM System z user organizations provided by IBM. The composite organization that Forrester synthesized from these results is a Fortune 500 retail organization based in North America with more than 1,500 full-time IT associates and more than 3,000 contractors. The organization currently has two data centers in the environment and one additional data center for backup and recovery. Prior to the investment in System z for SAP, the organization had its financial systems and purchase order management systems, including its master data record, running on System z. The organization undertook a SAP implementation and decided to add this new workload to System z. At the same time, the organization acquired a smaller retail organization with 200 stores. The acquired organization used a distributed platform with hundreds of servers. The composite organization chose to consolidate to the SAP Business Suite hosted on the IBM System z platform. Please see Appendix A for a more detailed description of the composite organization.

Framework Assumptions

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. Other assumptions are shown in later tables.

Costs

The main costs associated with the composite organization's deployment of IBM System z are: 1) upfront hardware costs; 2) internal labor costs for planning and design; 3) internal labor costs for implementation; and 4) annual administrative support costs for the System z solution. The following are the cost inputs to the financial analysis.

Hardware

One of the primary costs of the System z implementation was the cost to procure the hardware from IBM. For our representative organization, Forrester assumes the organization purchases two System z units at a cost of $1,000,000. The organization also purchases storage to support the new environment at a cost of $500,000 per year. This results in a total three-year spend of $2,500,000 or PV of $2,243,426.

Internal Implementation Cost

Organizations can choose to implement System z using internal resources or through employing an IBM partner. The interviewed companies chose either approach based on the complexity of the implementation and their prior experience and knowledge of IBM. Should readers choose to augment their implementation with third-party resources, a cost category should be added for professional fees.

The composite organization used internal resources to deploy the SAP application on System z. This work included planning, migration of the application, and testing of the environment.

With this reported customer experience as a basis, Forrester assumes that the composite organization had 15 full-time equivalents (FTEs) responsible for the migration. The total hours spent for the migration consisted of 4,160 or the equivalent of two years of man hours per individual. Assuming a fully loaded annual cost per FTE for this blended team is $85,000 per year, total internal labor costs for planning and design were $2,550,000.

Administrative Costs

The organizations interviewed estimated support and administrative costs for day-to-day support of IBM System z. This cost includes the cost of performing updates to the system as well as day-to-day maintenance of the environment. Forrester estimates the annual internal administrative costs for the organization to be six FTEs at an annual fully loaded compensation of $85,000 per FTE. This translates to $510,000 per year or $1,530,000 over a three-year period.

Training Costs

For organizations that have never implemented System z, there may be additional training costs with their implementation. As the composite organization had existing expertise in System z, it did not incur additional training costs.

Total Costs

Total costs for the composite organization's deployment of IBM System z are shown in the following table.

Table 2
Total Costs (Non-Risk-Adjusted)

Costs	Initial	Year 1	Year 2	Year 3	Total
Hardware costs	($1,000,000)	($500,000)	($500,000)	($500,000)	($2,500,000)
Implementation costs	($2,550,000)				($2,550,000)
Administrative costs		($510,000)	($510,000)	($510,000)	($1,530,000)

Total	($3,550,000)	($1,010,000)	($1,010,000)	($1,010,000)	($6,580,000)

Source: Forrester Research, Inc.
Note: Numbers may not align due to rounding.

Benefits

In interviews with IBM customers, Forrester identified several benefits of implementing IBM System z in the areas of capital and operational efficiency and high availability. These quantified benefits include: 1) improved scalability through reduction in server administration staff; 2) cost avoidance of maintaining distributed platform infrastructure; 3) reduced cost of storage; 4) cost savings as a result of lower downtime; and 5) improved flexibility.

> *"Every layer of complexity you add has the potential for human error that can lead to downtime or interrupted service. Our environment [with IBM System z] is very simple. It's easy to operate on a daily basis."* (Vice president (VP) of information services, electric technology manufacturer)

In addition to the quantified benefits cited above, organizations also noted additional qualitative benefits beyond just direct benefits of the platform. These include risk reduction and better security, improved speed and business credibility.

Improved Scalability — Reduction In Server Administration Staff

Reducing the cost to support mission-critical applications was a common theme among the interviewed organizations. Over the past several years, these organizations were seeing rapid growth of resources to support. As a result, the cost to manage both SAP and non-SAP environments increased yearly with the growth of staff to support their mission-critical environment. For these organizations, reducing the growth and cost of staffing by improving the efficiency of their existing employees was a key reason to consolidate away from a distributed environment and migrate their environment to System z. One organization estimated that it would have to double or triple its FTE cost to meet the demands of its business growth without System z.

Organizations noted several key capabilities found within System z, compared with these organizations' older distributed environment. Specifically having a single centralized device can reduce the need to have distributed staff in multiple locations. In addition, having a centralized architecture reduces the likelihood of having to make changes on separate individual servers, reducing overall cost of administration. Another company interviewed noted that infrastructure simplification and the centralized integrated model have lowered its IT support costs by 50%.

In order to construct this benefit, the representative organization can potentially reduce the number of administrators to support the environment by 50%, resulting in a total reallocation of 15 server administrators. The model also assumes that without the investment, the number of administrators on staff will increase by one FTE per year to take into account the increase in transaction queries and storage growth. The resulting shift to System z allows the organization to better manage its application environment, resulting in a reduction in the growth of staffing. Table 3 illustrates the calculation used.

Table 3

Reduction In Server Administration Staff

Ref.	Metric	Calculation	Per period
A1	Number of workers (saved)		15
A2	Yearly rate per worker		$85,000
At	Reduction in server administration staff	A1*A2	$1,275,000

Source: Forrester Research, Inc.

Cost Avoidance Of Maintaining Distributed Platform Infrastructure

In addition to the administration savings in moving away from a distributed to centralized environment for mission-critical applications, organizations also noted the capital cost savings as a result of the migration. This included fewer servers to refresh as well as indirect costs of supporting the environment including power and cooling savings realized in moving to a centralized architecture.

> *"As we continued to consolidate on System z, our costs dropped from 2% to 1.5% of sales. We continue to add functionality, and costs keep going down."* (VP of information services, electric technology manufacturer)

One organization anticipated 25% savings in data center costs with its implementation of System z and was surprised to find its savings closer to 35%. One manufacturing organization estimated that running its manufacturing and financial systems on distributed architecture instead of System z would have cost 10 times more when taking into consideration software licenses, support, hardware, management, and security. This organization also noted that it saved 60% in power cooling costs and 50% in data center floor space requirements with its System z implementation. One organization consolidated an acquisition's distributed platform running SAP onto System z and noted that this contributed to approximately $8,000,000 in infrastructure savings.

To calculate the cost-avoidance benefit of maintaining distributed platforms, Forrester assumes the composite organization can reduce the number of physical machines as well as the indirect costs resulting from shared services architecture from network, processors, and virtualization. As there is no need for network switches, infrastructure can run multitudes of virtualization including 100 virtual Linux machines on one System z machine. This saves the organization maintenance costs of $2,000,000 per year or $6,000,000 over three years.

Table 4

Reduction In Cost Of Maintaining Distributed Platform Infrastructure

Ref.	Metric	Calculation	Per period
B1	Annual cost avoidance of distributed platform		2,000,000

Bt	Reduction in cost of maintaining distributed platform infrastructure (per year)	B1	$2,000,000

Source: Forrester Research, Inc.

Reduced Cost Of Storage

The third area of benefit noted by the interviewed organizations was the ability to reduce the organizations' storage footprint by moving to a centralized architecture. Having the application managed and run centrally, the organizations can consolidate and achieve higher levels of compression, compared with a distributed architecture. One organization in particular noted improved compression rates of between 60% and 70% in a centralized storage environment.

To calculate this benefit, Forrester assumes the composite organization can reduce and consolidate the storage resources used through improved rates of compression with System z. As a retail organization, the composite company has high levels of storage required for its transaction processing systems. In the distributed environment, the organization would have to spend $6,000,000 over the course of three years to procure, support, and manage the server environment. With System z, the organization's storage requirements would be reduced by 68%, providing a total savings of $4,080,000 over three years.

Table 5
Reduced Cost Of Storage

Ref.	Metric	Calculation	Per period
C1	Cost of storage		$6,000,000
C2	Reduction in cost		68%
Ct	Reduced cost of storage	C1*C2	$4,080,000

Source: Forrester Research, Inc.

Reduced Downtime Leading To Cost Savings

While the previous benefits focused on the cost-efficiency of consolidating and centralizing around System z, another key benefit for interviewed organizations was around maintaining high availability within the mission-critical environment. Organizations noted that as a result of centralization, the time to restore from planned outages was reduced, compared with the distributed environment.

One organization stated that System z has helped it minimize downtime for critical applications, reporting that it had fewer than 4 hours of downtime over the past five years with System z. One financial institution interviewed noted that moving from a distributed environment to System z has significantly improved its availability. It went from 14 incidents of downtime in one year to zero incidents in four years with its System z implementation. At its current size, this institution could see potential government fines of $4,000,000 per day of outage. Prior to its implementation of

System z, it incurred $500,000 in fines. At a conservative estimate, its move to System z has saved it $2,000,000 in fines over four years. Other organizations interviewed noted that System z had faster recovery times, compared with other platforms, and helped it reduce its planned outages.

The value of downtime is unique to each organization and may vary from company to company. For the summary ROI calculations presented in this study, Forrester has concentrated on results for downtime impact received from the interviewed organizations that include both the internal impact of not being able to access the mission-critical application and the potential resulting impact externally of not being able to access data. For an ERP application, for example, this could include both human resources and finance information accessed internally as well as supply-chain and procurement data required by external partners. Table 6 summarizes the additional impact that Forrester believes the composite company can gain as a result of the move to IBM System z. In this example, the composite organization's cost per outage is $300,000 per hour. With three planned outages per year, the total cost savings from reduced downtime through System z is $2,700,000 per year.

Table 6

Cost Savings From Reduced Downtime

Ref.	Metric	Calculation	Per period
D1	Number of planned outages		3
D2	Cost per hour of outage		$300,000
D3	Number of hours		3
Dt	Cost avoidance of downtime from planned outages	D1*D2*D3	$2,700,000

Source: Forrester Research, Inc.

Improved Flexibility For Business Needs

Another benefit that emerged from the interviews was the organizations' improved flexibility with their move to System z. Two financial institutions interviewed both observed that they now had better response to project needs of the business. In one organization's previous environment, deploying IT resources for projects would have taken at least two months. With System z, it could deploy resources within 24 hours to support projects such as new financial transactions and products, system improvements, new offices, new application and functionality, as well as faster response to changes in Central Bank regulations.

Another interviewed organization noted that by building web services infrastructure around IBM WebSphere DataPower and zEnterprise, they could now easily connect new web services to use this solution. Projects that would have taken at least half a year to implement now took between two to three months from testing to production. Business initiatives that required the organization to expose web services in a secure way to external partners could now be completed faster. As one program manager stated, "Now we have projects in line to use DataPower. Seems like it's been the missing piece."

Other organizations interviewed observed that implementing System z has given them additional flexibility to use available capacity. They've been able to mix workloads into a single image, move workloads easily for off-hours performance testing, and, in one case, save $750,000 in hardware costs for application services migration.

Without System z, the composite organization would have had to spend an additional $750,000 in server capacity for an application service migration. The improved flexibility with System z has saved it $750,000 in new hardware costs.

Table 7

Improved Flexibility

Ref.	Metric	Calculation	Per period
E1	Hardware savings		$750,000
Et	Improved flexibility	E1	$750,000

Source: Forrester Research, Inc.

Total Benefits

Table 8 summarizes the quantified benefits from an investment in IBM System z for the composite company.

Table 8

Total Benefits (Non-Risk-Adjusted)

Benefits	Initial	Year 1	Year 2	Year 3	Total
Reduction in server administration staff		$1,275,000	$1,275,000	$1,275,000	$3,825,000
Cost avoidance of maintaining distributed platform infrastructure		$2,000,000	$2,000,000	$2,000,000	$6,000,000
Reduced cost of storage		$4,080,000			$4,080,000
Cost savings from reduced downtime		$2,700,000	$2,700,000	$2,700,000	$8,100,000
Improved flexibility		$750,000			$750,000
Total		$10,805,000	$5,975,000	$5,975,000	$22,755,000

Source: Forrester Research, Inc.

Other Benefits Not Quantified

> *"In terms of the long-term impact of using System z for business projects, it is a faster, cheaper, more powerful, and more secure alternative ."* (Manager, system programmer team, Scandinavian bank)

Other qualitative benefits cited by the customers interviewed but not quantified in this study include the following.

Risk Reduction And Improved Security

Organizations interviewed noted that the high availability and secure infrastructure of System z has reduced the risk to their organizations as they run their mission-critical business applications on System z. One financial services organization cited improved security through the administration of the server as being one of the most valuable features around their use of zEnterprise. They noted that the transaction security features of WebSphere DataPower for zEnterprise as one of the main benefits to their company. A system programmer manager also added, "Since the [WebSphere DataPower] blade is rule based, you can decide which people can work with this product. It's appliance-based, that's part of the security. You can terminate ssl in the box."

Improved Speed with zEnterprise

Companies also noted that improved speed was a benefit with their move to zEnterprise. They observed that WebSphere DataPower for zEnterprise was built to optimize workloads, to process XML and web services protocols faster. As one customer observed, "XML is a heavy process and, for WebSphere DataPower for zEnterprise, that's the main thing it's supposed to handle."

Better Business Credibility

Some of the organizations interviewed also noted that working with IBM System z also improved their business credibility with their partners. These organizations typically dealt heavily with financial transactions such a credit card processing. "They use operational risk rating to qualify business partners, and with the mainframe, our rating is better," one organization noted. Another organization stated that PCI compliance was a huge issue and was one of the drivers for its move to System z from its distributed platform.

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. From our interviews, we've found that with the flexibility of IBM System z, there are multiple scenarios in which a customer deploys centralized architecture now and later realizes additional uses and business opportunities.

- Utilization of additional untapped System z features, such as the ability to convert XML to Cobol, could contribute to improved developer productivity labor savings

- Future projects implemented on System z could result in additional revenue as well as project cost savings

To provide an example of how to compute the value of flexibility, one organization interviewed implemented WebSphere DataPower for zEnterprise to offload CPU cycles from the mainframe to reduce costs for mainframe software. The benefits of this project are estimated at mainframe software fee savings of $441,402 annually or a net present value of $1,097,701 over three years. The project costs $1,048,701 which includes hardware, maintenance fees and implementation labor costs.

The flexibility component of TEI captures that value using either the financial industry standard Black-Scholes or the binomial option pricing models. With a two-year time frame to use this option, as the organization will only start

considering this opportunity after Year 1, Forrester values the above flexibility option at $400,179. This value exists in addition to risk-adjusted benefits and ROI for that particular customer.

Table 9

Flexibility Analysis — Offloading Mainframe CPU's

Ref.	Metric	Calculation	Per period
J1	Asset value (savings benefit)		$1,097,701
J2	Cost to acquire — hardware, maintenance and implementation		$1,048,701
J3	Expiration (time to expire, in years)		2
Jt	Flexibility	Black-Scholes model	$400,179

Source: Forrester Research, Inc.

The value of flexibility is unique to each organization, and the willingness to measure its value varies from company to company (see Appendix A for additional information regarding the flexibility calculation).

Risk

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 IBM System z 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 IBM System z, resulting in lower overall total benefits. The greater the uncertainty, the wider the potential range of outcomes for cost and benefit estimates.

Quantitatively capturing investment and impact risks by directly adjusting the financial estimates results in 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, as they represent the expected values considering risk.

The following implementation risk that affects costs is identified as part of this analysis:

- Migration risks, as internal labor needed for planning and design, implementation, training, and support may exceed initial estimates.

- Risk that the environment to be migrated was not sized correctly so additional capacity would have to be purchased.

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

- Variability in infrastructure and labor savings for different organization deployments.

- Variability in impact of downtime.

Table 10 shows the values used to adjust for risk and uncertainty in the 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. Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Table 10

Cost And Benefit Risk Adjustments

Costs	Low	Most likely	High	Mean
Hardware costs	98%	100%	105%	101%
Implementation costs	100%	100%	115%	105%
Administrative costs	100%	100%	110%	103%
Benefits	**Low**	**Most likely**	**High**	**Mean**
Reduction in server administration staff	90%	100%	105%	98%
Cost avoidance of maintaining distributed platform infrastructure	90%	100%	105%	98%
Reduced cost of storage	90%	100%	105%	98%
Cost savings from reduced downtime	80%	100%	103%	94%
Improved flexibility	90%	100%	105%	98%

Financial Summary

The financial results calculated in the Costs and Benefits sections can be used to determine the ROI, NPV, and payback period for the organization's investment in IBM System z. These are shown in Table 11.

Table 11
Cash Flow — Non-Risk-Adjusted

Cash flow — original estimates						
	Initial	**Year 1**	**Year 2**	**Year 3**	**Total**	**PV**
Costs	($3,550,000)	($1,010,000)	($1,010,000)	($1,010,000)	($6,580,000)	($6,061,721)
Benefits	$0	$10,805,000	$5,975,000	$5,975,000	$22,755,000	$19,249,850
Net benefits		$9,795,000	$4,965,000	$4,965,000	$16,175,000	$13,188,129
ROI	218%					
Payback period	4.35 months					

Source: Forrester Research, Inc.

Table 12 shows the risk-adjusted ROI, NPV, and payback period. These values are determined by applying the risk-adjustment values from Table 10 in the Risk section to the cost and benefits numbers in Tables 2 and 8.

Table 12
Cash Flow — Risk-Adjusted

Cash flow — risk-adjusted estimates						
	Initial	**Year 1**	**Year 2**	**Year 3**	**Total**	**PV**
Costs	($3,677,500)	($1,025,300)	($1,025,300)	($1,025,300)	($6,753,400)	($6,227,269)
Benefits	$0	$10,480,900	$5,747,500	$5,747,500	$21,975,900	$18,596,273
Net benefits		$9,455,600	$4,722,200	$4,722,200	$15,222,500	$12,369,004
ROI	199%					
Payback period	4.67 months					

Source: Forrester Research, Inc.

The data collected in this study indicates that deploying IBM System z has the potential to provide a solid ROI through quantifiable infrastructure, maintenance, support, and labor cost savings as well as savings from reduced downtime. The risk-adjusted ROI of 199%, along with a payback period (breakeven point) over four months, raises confidence that the investment is likely to produce a positive outcome, especially after the risks and uncertainty that may affect the project have been considered, quantified, and incorporated into the business case.

In interviews with IBM customers, Forrester found that organizations can realize benefits in the form of:

- Reduction in server administration staff.

- Cost avoidance of maintaining distributed platform infrastructure.

- Reduced cost of storage.

- Cost savings from reduced downtime.

- Improved flexibility.

- Risk reduction.

- Improved business credibility.

Based on these findings, companies looking to implement IBM System z can anticipate quantifiable cost-avoidance savings, reduction in downtime, improved scalability, and flexibility. Using the TEI framework, many companies may find a potentially compelling business case to make such an investment.

IBM zEnterprise System: Overview

According to IBM, the demands of customers, partners, employees—and the demands of a fast moving market—are stretching the limits of today's data centers. Add to this the management and integration challenges data centers face as they invest in the next generation of smart applications and it is clear something new is needed. Smarter computing systems—systems that raise the bar on efficiency, performance and cost savings while lowering management complexity.

The IBM® zEnterprise™ System (zEnterprise) offers a revolutionary system design that addresses the complexity and inefficiency in today's multiarchitecture data centers. The zEnterprise extends the strengths and capabilities of the mainframe—such as security, fault tolerance, efficiency, virtualization and dynamic resource allocation—to other systems and workloads running on AIX® on POWER7®, Linux on System x and now Microsoft Windows—fundamentally changing the way data centers can be managed.

The zEnterprise is a workload-optimized, multiarchitecture compute system capable of hosting many workloads integrated together, and efficiently managed as one single entity. It is designed to deploy and intelligently manage workloads across both mainframe and distributed technologies with the same tools, techniques and a single management interface.

The zEnterprise System includes a central processing complex (CPC)—either the zEnterprise 196 (z196) or the zEnterprise 114 (z114), the IBM zEnterprise BladeCenter® Extension (zBX) with its integrated optimizers and/or select IBM blades, and the zEnterprise Unified Resource Manager.

Three key components make up the zEnterprise System.

At the core of the zEnterprise System is the z196 or z114—the next generation mainframe that provides new levels of performance, security, capacity for growth and dramatic infrastructure simplification capabilities. Both the z196 and z114 are designed to work seamlessly with system software, middleware and storage to be the most robust, cost effective, efficient and reliable data serving and transaction processing environment.

The zBX is an infrastructure component that hosts both general purpose blade servers and appliance-like workload optimizers which can all be managed as if they were a single mainframe. The zBX utilizes a private high speed internal network that connects it to the central processing complex, which reduces the need for networking hardware and provides inherently high security. The zBX allows the zEnterprise to extend its strong portfolio to support AIX on Power and Windows or Linux on System x.

The IBM zEnterprise Unified Resource Manager integrates multiarchitecture platform resources as a single virtualized system and provides unified and integrated management across the zEnterprise System with the same tools, techniques

Highlights

A "System of Systems," design that embraces the integration and management of multiple technology platforms— mainframe, UNIX, and x86—to dramatically improve productivity of today's multiarchitecture data centers.

Supports z/OS®, Linux on System z®, z/VSE®, z/VM®, z/TPF, AIX®, Linux on IBM System x®, and now Microsoft Windows operating environments.

Unique hybrid computing capabilities powered by the industry's premier enterprise server, providing breakthrough innovation, virtualization, and unrivalled scalability, reliability, and security.

Rapidly deploy services using prepackaged solutions and preintegrated technologies designed to meet the needs of specific workloads.

and resources for consistent, automated and reliable service delivery. The Unified Resource Manager can auto-discover new server, network and storage resources, load the virtualization environments, and prepare system resources for use. It can identify system bottlenecks or failures among disparate systems and if a failure occurs it can dynamically reallocate system resources to keep applications running smoothly. It can dramatically simplify operations across the various application environments. The Unified Resource Manager also provides energy monitoring and management, goal-oriented resource management, increased security, virtual networking, and information management, all integrated into a single easy-to-use interface—dramatically simplifying operations across multiple application environments.

New application programming interfaces (APIs) allow integration between Unified Resource Manager and the broader ecosystem of management tools. This capability will allow service automation tools to be able to gain access to functions such as discovery, monitoring and provisioning for the heterogeneous resources owned by zEnterprise.

Appendix A: Composite Organization Description

Composite Organization

Based on the interviews with existing IBM System z customers, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis that illustrates the areas affected financially. The composite organization that Forrester synthesized from these results is described by the following characteristics.

Organization size and dimensions:

• The composite organization was a Fortune 500 retail organization based in North America.

• The IT organization has 1,500 full-time IT associates with more than 3,000 contractors.

• There are currently two data centers in the environment and one data center for recovery.

Environment prior to IBM System z investment:

• The organization had its financial systems and purchase order management systems, including its master data record, running on System z.

• The organization undertook a SAP implementation and decided to add this new workload to System z.

• At the same time, the organization acquired a smaller retail organization with 200 stores. The acquired organization used a distributed platform with hundreds of servers.

• The organization chose to consolidate to SAP Business Suite hosted on the IBM System z platform.

Reasons for investment in IBM System z:

• To address the need for high availability for its retail systems and avoid lost sales due to downtime.

• To address the need for scalability, as its retail store footprint was expanding.

• To leverage its knowledge base and IT resources, as it already used System z as the platform for many applications.

• To achieve economies of scale and reduce the cost of supporting and maintaining a distributed architecture.

• To align with the CEO's strategy to increase productivity without increasing resource costs, with the organization wanting to avoid hiring additional system administrators as the company continued to grow.

Appendix B: Total Economic Impact™ Overview

Total Economic Impact (TEI) 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.

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 of 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: 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 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 C: 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 respective 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 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

For 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 and are the sum of the initial investment and the discounted cash flows in each year.

Table [Example]

Example Table

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

Source: Forrester Research, Inc.

Appendix D: Endnotes

---

[1] Source: "Application Retirement — It's Time To Put The Elephant In The Room On A Diet," Forrester Research, Inc., February 3, 2011.