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The Total Economic Impact Of IBM Information Server

Single Company Analysis - Telecommunications

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The Total Economic Impact Of IBM Information Server

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Executive Summary

In July 2006, IBM commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises may realize by deploying IBM Information Server. Information Server, formerly Ascential Software, is a set of tools that provide the integration and transformation of data and content to deliver information throughout its life cycle. This study illustrates the financial impact of adopting IBM Information Server and its DataStage module within a North-America-based telecommunications provider.

In conducting in-depth interviews with the telecom provider, Forrester found that this company achieved through IBM DataStage the ability to reduce development cost in integrating different sources of siloed data, improved integration time, and improved data quality. In addition, IBM DataStage, in conjunction with the implementation of WebSphere Customer Center (WCC), provided the organization with a single customer view, driving higher customer satisfaction and account enrichment.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Information Server on their organizations. Forrester's aim is to clearly show all calculations and assumptions used in the analysis. Readers should use this study to better understand and communicate a business case for investing in IBM Information Server.

Methodology

IBM selected Forrester for this project because of its industry expertise in data integration technologies 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 the adoption of Information Server within the telecommunications organization:

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

Given the increasing sophistication that enterprises have 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 B for additional information on the TEI methodology.

Approach

Forrester used a five-step approach for this study.

1. Forrester gathered data from existing Forrester research relative to IBM Information Server and the data integration market in general.

2. Forrester interviewed IBM Information Server marketing and sales personnel to fully understand the potential (or intended) value proposition of IBM Information Server solution.
3. Forrester conducted a series of in-depth interviews with a North American telecommunications organizations currently using IIBM Information Server solution.
4. Forrester constructed a financial model representative of the interviews. This model can be found in the TEI Framework section below.
5. Forrester created a composite organization based on the interviews and populated the framework using data from the interviews as applied to the composite organization.

Key Findings

Forrester's study yielded three key findings:

- **ROI.** Based on the interviews with the telecommunications customer, Forrester constructed a TEI framework (see Appendix A), and the associated ROI analysis illustrating the financial impact areas. As seen in Table 1, the ROI for our composite company is 143% with a breakeven point (payback period) of 1.3 years after deployment.
- **Benefits.** Benefits of deploying IBM DataStage included the ability for the organization to improve the efficiency of the development process, resulting in lower development costs and improved time to benefit for development projects. In addition, implementing IBM DataStage allowed the organization to make subsequent investments in WCC allowing for deeper customer data visibility.
- **Costs.** Costs of the IBM DataStage product included the costs of Information Server licenses and maintenance, additional hardware infrastructure costs, ongoing services costs, as well as costs of implementation and developer training.

Table 1 illustrates the risk-adjusted cash flow for the organization, based on data and characteristics obtained during the interview process. Forrester risk-adjusts these values to take into account the potential uncertainty that exists in estimating the costs and benefits of a technology investment. The risk-adjusted value is meant to provide a conservative estimation, incorporating any potential risk factors that may later impact the original cost and benefit estimates. For a more in-depth explanation of risk and risk adjustments used in this study, please see the Risk section.

Table 1: Composite Company ROI, Risk-Adjusted

Ref.	Total benefits	Calculation	Initial	Year 1	Year 2	Year 3	Total	NPV
H1	Total costs		(\$1,218,433)	(\$142,800)	(\$142,800)	(\$142,800)	(\$1,646,833)	(\$1,561,415)
L1	Total benefits			\$911,400	\$1,709,322	\$2,279,096	\$4,899,818	\$3,798,627
P2	Total		(\$1,218,433)	\$768,600	\$1,566,522	\$2,136,296	\$3,252,985	\$2,237,212
P3	Return on investment	(L1-H1) * H1	143%					
P4	Payback period (yrs)		1.3					

Source: Forrester Research, Inc.

Forrester found the primary drivers associated with the ROI at the representative organization were the amount of data integration, the number and level of experience of the development staff, and the ultimate benefits to the organization of the development project.

Disclosures

The reader should be aware of the following:

- The study is commissioned by IBM and delivered by the Forrester Consulting group.
- IBM reviewed and provided feedback to Forrester, but Forrester maintained editorial control over the study and its findings and did not accept changes to the study that contradict Forrester’s findings or obscure the meaning of the study.
- The customer names for the interviews were provided by IBM.
- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that the readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in IBM Information Server.
- This study is not meant to be used as a competitive product analysis.

IBM Information Server: Overview

According to IBM, information integration is the process of integrating and transforming data and content to deliver authoritative, consistent, timely, and complete information and governing the quality of that information throughout its life cycle.

Increased information integration can potentially provide:

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- Increased business insight and competitiveness, grounding business decisions and operations in authoritative, consistent, timely, and complete information.
- Reduced business risk by basing business processes on authoritative, consistent, timely, and complete information.
- Improved productivity and operational efficiency through easy access to authoritative, consistent, timely, and complete information.

Understand information: Automated data profiling and analysis to unlock the mystery of source data content and structure.

Cleanse information: Data quality enhancement to identify, correct, match, standardize, and reconcile inaccurate or redundant data.

Transform information: Data transformation and delivery to get data of any complexity from any sources, format it as required, and deliver it to any targets, within or outside the enterprise, at the right time.

Federate information: Information access and integration for diverse data and content as if it were a single resource, regardless of where the information resides.

Connect information: Consolidation, synchronization, and distribution across disparate databases.

Analysis

As stated in the Executive Summary, Forrester took a multistep approach to evaluate the impact that implementing Information Server can have on an organization:

- Interviews with IBM marketing and sales personnel.
- In-depth interviews of a North American telecommunications organization currently using the DataStage component of Information Server.
- Construction of a common financial framework for the implementation of Information Server.
- Construction of a composite organization based on characteristics of the interviewed organizations.

Interview Highlights

The interviews uncovered a number of characteristics of this customer's need for improved data integration and the results of implementing IBM DataStage:

- In 1998, the organization embarked on a formal enterprise data warehouse program. One of the program's goals was to reduce IT operational cost through consolidation of multiple, disparate databases into a single core database.
- With the consolidation of databases, the organization continued to use primarily custom ETL tools for the mainframe environment. The development environment was primarily COBOL.
- In 2002, the organization undertook a transition from mainframe to midrange equipment and source systems became increasingly non-mainframe. As a result, the organization saw the need to drive development productivity through the use of a platform that could interact with heterogeneous platforms, asynchronous data sources, and updated operating systems.
- The organization chose Ascential primarily for its DataStage product and the robustness of the ETL platform.
- The organization saw that the primary benefit in moving away from internally built ETL solutions to Information Server was to drive development productivity in a rapidly changing environment.

TEI Framework

Introduction

From the information provided in the in-depth interviews, Forrester has constructed a TEI framework for those organizations considering implementation of IBM DataStage . The objective of the framework is to identify the cost, benefit, and risk factors, and flexibility that affect the investment decision.

Framework Assumptions

Table 2 lists the discount rate used in the PV and NPV calculations and the time horizon used for the financial modeling.

Table 2: General Assumptions

Ref.	General assumptions	Value
	Discount rate	12%
	Length of analysis	Three years

Source: Forrester Research, Inc.

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

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used within this analysis.

Table 3: Salary Assumptions

Ref.	Metric	Calculation	Value
A1	Hours per week		40
A2	Weeks per year		52
A3	Hours per year (M-F, 9-5)		2,080
A4	Hours per year (24x7)		8,736
A6	Hourly		\$48

Source: Forrester Research, Inc.

Costs

Costs around IBM DataStage for the interviewed organization include cost of hardware, software, maintenance, implementation, and ongoing administration. The actual cost of the solution will vary depending on the size of the development staff as well as the level of data integration undertaken by the organization.

License Cost

The cost of licensing represents a portion of the overall investment cost of the solution. The organization purchased the IBM DataStage product in 2002 prior to IBM's acquisition of Ascential. License costs are priced according to the number of CPUs required. Based on interviews with the representative organization, the estimated license cost was \$460,000 at the time of purchase. This would have been enough to cover the cost of the ETL production and development environment. Table 4 illustrates the cost of licensing.

Table 4: License Cost

Ref.	Metric	Calculation	Initial cost
A1	License fees		\$460,000
At	IBM DataStage Enterprise Edition license fees	A1	\$460,000

Source: Forrester Research, Inc.

Hardware Cost

In addition to the cost of licensing, the organization indicated that it needed to incur roughly \$300,000 in infrastructure costs associated with the investment. These costs included the cost of additional servers to run the IBM DataStage platform, as well as necessary network upgrades to build a dedicated infrastructure for the development environment. Table 5 illustrates the incremental cost of hardware.

Table 5: Hardware Cost

Ref.	Metric	Calculation	Initial cost
B1	Hardware costs		\$300,000
Bt	Hardware costs	B1	\$300,000

Source: Forrester Research, Inc.

Annual Maintenance: Hardware And Software

In addition to the initial cost of hardware and software, the organization also incurs annual costs around software and hardware maintenance for the IBM DataStage platform. Based on the interviews with the representative organization, we assume the annual software maintenance cost equates to 18% of the cost of license while the annual maintenance cost equates to 20% of the initial server cost. Tables 6 and 7 illustrate the equations used.

Table 6: Annual Maintenance: Software

Ref.	Metric	Calculation	Per period
C1	License fees		\$460,000
C2	Yearly percent		18%
Ct	Software maintenance cost	$C1 * C2$	\$82,800

Source: Forrester Research, Inc.

Table 7: Annual Maintenance: Hardware

Ref.	Metric	Calculation	Per period
D1	License fees		\$300,000
D2	Yearly percent		20%
Dt	Hardware maintenance cost (yearly)	$D1 * D2$	\$60,000

Source: Forrester Research, Inc.

Additional Software Cost

The interviewed organization also indicated that in addition to the IBM DataStage platform, the organization had to purchase additional software to maximize the features found within the Information Server platform. These included performance monitoring tools that allowed the organization to get a better understanding of the effective use of IBM DataStage within the environment. The interviewed organization indicated the additional cost of this software to be roughly 20% of the original license fee of the IBM DataStage platform. This equates to roughly \$92,000 for additional software fees. Table 8 illustrates the equation used.

Table 8: Additional Software Cost

Ref.	Metric	Calculation	Initial cost
A1	License cost for Information Server platform		\$460,000
E2	Cost of additional software as a percentage of overall license cost		20%
Et	Additional software fees	$A1 * E2$	\$92,000

Source: Forrester Research, Inc.

Training Cost

The cost to train the individual developers on the new IBM DataStage platform was another cost cited by the interviewed organization. The organization indicated that it had 30 developers who it had trained on the IBM DataStage platform. Prior to implementing IBM DataStage, the majority of the developers had been trained on COBOL, and the organization had made an investment to re-train the developers on the IBM DataStage platform. For the purpose of this analysis, we assume that each of the 30 developers will participate in training totaling 80 hours. The cost per developer includes the formal cost of training, the lost productivity from participating in the training session, as well as the indirect cost of informal training. Table 9 illustrates the total training cost.

Table 9: Training Cost

Ref.	Metric	Calculation	Initial cost
F1	Number of people		30
F2	Cost per person		\$100
F3	Hours		80
Ft	Training developers	$F1 * F2 * F3$	\$240,000

Source: Forrester Research, Inc.

Implementation Cost

The cost to implement the IBM DataStage platform includes the cost of internal resources to plan and deploy the Information Server platform. In discussions with the interviewed organization, we estimate that internal staff devoted roughly 1,000 hours to the implementation of the IBM DataStage platform. Assuming an hourly cost of \$100 per hour, the total implementation cost of IBM DataStage for the interviewed organization comes to \$100,000. Table 10 illustrates the total implementation cost.

Table 10: Implementation Cost

Ref.	Metric	Calculation	Initial cost
G1	Number of hours		1,000
G2	Cost per hour		\$100
Gt	Implementation cost	$G1 * G2$	\$100,000

Source: Forrester Research, Inc.

Total Costs

Table 11 illustrates the total incremental costs of the IBM DataStage platform for the interviewed organization.

Table 11: Total Cost

Cash Flow Analysis (Original Estimates)						
Costs	Initial	Year 1	Year 2	Year 3	Total	Present value
IBM DataStage Enterprise Edition license fees	(\$460,000)				(\$460,000)	(\$460,000)
Hardware costs	(\$300,000)				(\$300,000)	(\$300,000)
Software maintenance cost		(\$82,800)	(\$82,800)	(\$82,800)	(\$248,400)	(\$198,872)
Additional software cost	(\$92,000)				(\$92,000)	(\$92,000)
Hardware license fees (yearly)		(\$60,000)	(\$60,000)	(\$60,000)	(\$180,000)	(\$144,110)
Training developers	(\$240,000)				(\$240,000)	(\$240,000)
Implementation cost	(\$100,000)				(\$100,000)	(\$100,000)
Total	(\$1,192,000)	(\$142,800)	(\$142,800)	(\$142,800)	(\$1,620,400)	(\$1,534,982)

Benefits

The second component of this analysis looks at the potential benefits associated with an organization investing in the IBM DataStage platform. As a result of the interview process, the representative organization indicated that it received benefits from reduced overall development cost as well as acceleration of time to benefits associated with the migration to the IBM DataStage platform.

Development Cost Efficiency

In discussions with the interviewed organization, the organization noted that the migration to IBM DataStage allowed for developers to become more efficient and reduce the overall cost of project deployment. Cost reduction was one of the key drivers for the organization in migrating to the new platform; it recognized that continuing to use custom development was much more costly as the organization migrated away from the mainframe environment for their core systems. The organization noted that it had anticipated a 30% cost reduction savings in development cost as a result of migrating to the IBM DataStage product. The 30% cost reduction estimate is used as the basis to calculate the overall financial savings to the organization. To perform this analysis, we assume that the organization prior to the migration to Information Server was spending roughly \$14 million per year on custom development. A 30% reduction in cost would equate to \$4.2 million (\$14 million*30%) leading to a revised development cost of \$9.8 million. As part of this analysis, we concretely estimate that only 50% of the estimated cost savings is actually transferred to the organization's bottom line, leading to a net yearly savings of \$2.1 million. In addition, we assume that the benefits for development cost efficiency do not ramp up to 100% until the third year of analysis. As a result, the annual benefit in Year 1 is further reduced by 50% in Year 1 and 75% in Year 2. Table 12 illustrates the equation used to calculate total savings.

Table 12: Development Cost Efficiency

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total	Present value
A1	Total development cost before deployment		\$14,000,000				
A2	Estimated reduction in development cost		30%				
A3	Total development cost after deployment		\$9,800,000				
A4	Percent benefit captured		50%				
Ato	Total (original)		\$1,050,000	\$1,575,000	\$2,100,000	\$4,725,000	\$3,833,959

Time To Benefit Savings

In addition to reducing the overall cost development, migrating to IBM DataStage also had the effect of reducing the time it took for the organization to start receiving benefit for its development projects. The organization noted that generally for development projects to be approved, a positive payback must be received within 18 months after the investment has been made. Prior to Information Server, we assume that the organization has, on average, 10 projects per year with an average three-year cost of \$1.4 million. We also assume that the average return on successful projects equates to 50% or a net positive return over three years of \$700,000 for a project that has received a payback within 18 months. The average monthly return over 36 months is \$19,444 per month (\$700,000/36). Based on discussions with the interviewed organization, we conservatively estimate that on average the time to receive benefit can be reduced by 3 months, allowing the organization to receive 3 months, or \$58,333, of benefit sooner (\$19,444*3). Applying this average value to all 10 projects per year, we can estimate the annual time-to-benefit estimate as \$583,333. Forrester assumes that 75% of the benefits will be realized in the second year of analysis and 100% in Year 3 due to the time it takes to migrate to the solution. Table 13 illustrates the calculation used.

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Table 13: Time To Benefit Savings

Ref.	Metric	Calculation	Year 1	Year 2	Year 3	Total	Present value
B1	Cost of project (pre- Information Server)		\$ 1,400,000				
B2	Number of projects		10				
B3	Average project return (%)		50%				
B4	Average three-year project return		\$700,000				
B5	Average monthly return		\$19,444				
B6	Improvement in time to benefit (months)		3				
B7	Per-project gain from increasing time to benefit		\$58,333				
Bt	Total (original)		\$0	\$437,500	\$583,333	\$1,020,833	\$799,837

Total Benefits

Table 14 illustrates the total three-year benefits as a result of the migration to the IBM DataStage platform. The total present value benefits equate to roughly \$4.6 million.

Table 14: Total Benefits

Cash Flow Analysis (Original Estimates)						
Benefits	Initial	Year 1	Year 2	Year 3	Total	Present value
Project cost saving		\$1,050,000	\$1,575,000	\$2,100,000	\$4,725,000	\$3,833,959
Acceleration in time-to-market saving			\$437,500	\$583,333	\$1,020,833	\$799,837
Total		\$1,050,000	\$2,012,500	\$2,683,333	\$5,745,833	\$4,633,797

Risk

Forrester defines two types of investment risk associated with this analysis: implementation and impact risk. **Implementation risk** is the risk that a proposed technology investment may deviate from original resource requirements needed to implement and integrate the investment, 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 technology investment, 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 risk by directly adjusting the financial estimates

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results in more meaningful and accurate estimates and a more accurate projection of the return on an investment.

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

- Installation and testing could demand more time than originally anticipated.
- Acquisition costs could be higher than originally anticipated for hardware and software.

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

- The amount of development savings may be lower than originally anticipated due to the time it takes to train and move to an integrated environment.
- The time-to-benefit savings may be lower than originally anticipated due to the time to integrate Information Server into existing technology.

Steps For Measuring Investment Risk

To calculate the final risk-adjusted estimates, Forrester applied a multistep process examining the impact of bias and variance on cost and benefit estimates.

- **Step 1: Calculate original cost and benefit estimates.** This is the initial calculation of the cost and benefit estimates without accounting for the impact of investment risk.
- **Step 2: Calculate the impact of bias for cost and benefit estimates.** To account for the impact of bias (most organizations overestimate benefits and underestimate cost estimates), this step recalculates the original cost and benefit estimates by using the average of the original estimate (calculated in Step 1) and a low and a high estimate.
- **Step 3: Calculate variance for cost and benefit estimates.** This step measures the impact of variance on cost and benefit estimates. Variance is a measure of the possible range of outcomes for cost and benefit estimates. Higher variance implies a wider range of possible outcomes, increasing the uncertainty in cost and benefit estimates.

The three steps are used to identify and incorporate the full impact of risk as part of a technology decision. The tables below illustrate the impact of implementation and impact risk on cost and benefit estimates. For more information on the application of risk, please see Appendix D.

Table 15: Risk Adjustment, Cost

Costs	Step 1			Step 2		Step 3	
	Original estimate	High	Low	Bias adjustment		Risk-adjusted	
				%	Value	%	Value
IBM DataStage Enterprise Edition license fees	(\$460,000)	(\$460,000)	(\$460,000)	100%	(\$460,000)	100%	(\$460,000)
Hardware costs	(\$300,000)	(\$300,000)	(\$300,000)	100%	(\$300,000)	100%	(\$300,000)
Software maintenance cost	(\$248,400)	(\$248,400)	(\$248,400)	100%	(\$248,400)	100%	(\$248,400)
Additional software cost	(\$92,000)	(\$92,000)	(\$92,000)	100%	(\$92,000)	100%	(\$92,000)
Hardware license fees (yearly)	(\$180,000)	(\$180,000)	(\$180,000)	100%	(\$180,000)	100%	(\$180,000)
Training developers	(\$240,000)	(\$300,000)	(\$210,000)	104%	(\$250,000)	104%	(\$260,000)
Implementation cost	(\$100,000)	(\$120,000)	(\$90,000)	103%	(\$103,333)	103%	(\$106,433)

Source: Forrester Research, Inc.

Table 16: Risk Adjustment, Benefit

Benefit	Step 1			Step 2		Step 3	
	Original estimate	High	Low	Bias adjustment		Risk-adjusted	
				%	Value	%	Value
Development cost saving	\$4,725,000	\$5,670,000	\$2,835,000	93%	\$4,410,000	93%	\$4,101,300
Acceleration in time-to-market saving	\$1,020,833	\$1,361,111	\$340,278	89%	\$907,407	88%	\$798,519

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, represents an investment in additional capacity or capability that could be turned into business benefit for some future additional investment. Flexibility would also be quantified when evaluated as part of a specific project (described in more detail in Appendix A).

The interviewed organization noted the use of the IBM Information Server platform in conjunction with WebSphere Customer Center (WCC) as a way to break down geographic barriers around existing customer data. WCC, in conjunction with the Information Server platform, provided the ability to build a set of services so that any operating system in the company can define a record with a customer key, be it in the form of the account number, telephone number, address or even the postal code, of a customer on an incoming interaction. This enables the organization to better

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define its customers and the services they provide across the organization. The flexibility that was created from the use of IBM Information Server with WCC potentially enabled accessing this information in less time and providing a deeper view of the customer.

While Forrester believes that organizations purchasing IBM Information Server and WCC in combination can take advantage of these flexibility options, quantification (using the financial industry standard Black-Scholes or the binomial option pricing models) of the additional value associated with these options for this customer would require scenario development and forward-looking analysis that is not available at this time.

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).

TEI Framework: Summary

Considering the financial framework constructed above, the results of the Costs, Benefits, Flexibility, and Risk sections using the representative numbers can be used to determine a return on investment, net present value, and payback period. Table 17 shows the consolidation of the numbers for the composite organization.

Table 17: Cash Flow Summary, Non-Risk Adjusted

Ref.	Total benefits	Calculation	Initial	Year 1	Year 2	Year 3	Total	NPV
H1	Total costs		(\$1,192,000)	(\$142,800)	(\$142,800)	(\$142,800)	(\$1,620,400)	(\$1,534,982)
L1	Total benefits			\$1,050,000	\$2,012,500	\$2,683,333	\$5,745,833	\$4,451,796
P2	Total		(\$1,192,000)	\$907,200	\$1,869,700	\$2,540,533	\$4,125,433	\$2,916,815
P3	Return on investment	$(L1-H1)*H1$	190%					
P4	Payback period (yrs)		1.2					

Table 18 below shows the risk-adjusted values, applying the risk adjustment method indicated in the "Risks" section and the values from Tables 15 and 16 to the numbers in Tables 11 and 14.

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Table 18: Cash Flow Summary – Risk Adjusted

Ref.	Total benefits	Calculation	Initial	Year 1	Year 2	Year 3	Total	NPV
H1	Total costs		(\$1,218,433)	(\$142,800)	(\$142,800)	(\$142,800)	(\$1,646,833)	(\$1,561,415)
L1	Total benefits			\$911,400	\$1,709,322	\$2,279,096	\$4,899,818	\$3,798,627
P2	Total		(\$1,218,433)	\$768,600	\$1,566,522	\$2,136,296	\$3,252,985	\$2,237,212
P3	Return on investment	(L1-H1)*H1	143%					
P4	Payback period (yrs)		1.3					

It is important to note that values used throughout the TEI Framework are based on in-depth interviews with a single 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 IBM DataStage.

Study Conclusions

Based on information collected in interviews with a current IBM DataStage customer, Forrester found that organizations can potentially realize benefits in the form of improved development efficiency within their current environment as well as faster time to benefit from their development projects.

The financial analysis provided in this study illustrates the potential way an organization can evaluate the value proposition of IBM DataStage. Based on information collected during the in-depth customer interviews, Forrester calculated a three-year risk-adjusted ROI of 143% for the composite organization with a payback period of 1.3 years. 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 IBM DataStage can see cost savings and productivity benefits. 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 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 one through three are discounted using the discount rate shown in Table 2 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.

Appendix C: Adjusting For Investment Risk (Example)

This example provides a high-level illustration of the measurement of investment risk to a single benefit estimate. The table below provides a high-level overview of the following steps.

Benefit	Step 1			Step 2		Step 3	
	Original estimate	High	Low	Bias adjustment		Risk-adjusted	
				%	Value	%	Value
Benefit 1	\$2,000	\$2,400	\$400	80%	\$1600	87%	\$1395

Step 1: Calculate Original Cost And Benefit Estimates

Suppose that an organization is trying to estimate the different types of benefits that might arise from a given technology investment. One potential expected benefit is savings per employee from the use of the technology. A sample benefit calculation is as follows:

Ref.	Metric	Calculation	Estimate
A1	Number of employees		200
A2	Savings per employee		\$10
A3	Total yearly estimated savings	A1 * A2	\$2,000

The \$2,000 represents the organization's original estimate of the yearly impact of the technology investment.

Step 2: Calculate The Impact Of Bias For Cost And Benefit Estimates

In Step 2, we account for the impact of bias in our original cost and benefit estimates. To measure the impact of bias, we need to calculate the range of possible outcomes of our original estimate by estimating possible high/low variables around our original estimates.

Ref.	Metric	Calculation	Estimate	Low	High
A1	Number of employees per year		200		
A2	Savings per employee		\$10		
A3	Total yearly estimated savings	A1 * A2	\$2,000	\$400	\$2,400
B1	Bias-adjusted estimate	$(\$2,000 + \$400 + \$2,400) / 3$	\$1,600		

In the case of our example, we have calculated our original estimate (\$2,000), our low estimate (\$400), and our high estimate (\$2,400). The unbiased estimate is calculated as the mean of the high and low estimates: [(\$2,000 + \$1,200 + \$2,400)/3 = \$1,600]. The revised estimate is now \$1,600. Reference A4 in the above table presents the revised estimate.

Step 3: Calculate The Impact Of Variance On Cost And Benefit Estimates

Once we have determined the impact of bias in our original estimates, the next step is to calculate the impact of variance. Variance measures the possible spread within our estimates. In the case of our example, the variance is based upon the low estimate (\$400), the high estimate (\$2,400), and the revised estimate (\$1,600). A wider spread would create higher uncertainty, and as a result, greater risk.

To calculate the impact of variance, we need to use the following calculations:

$$\frac{[(Lx)^2 + (x2)^2 + (Hx)^2] - (Lx)*(x2) - (Lx)*(Hx) - (x2)*(x2)*(Hx)}{18} = Var(x2)$$

Where		
Lx	Low estimate	\$400
X2	Revised (bias-adjusted) estimate	\$1,600
Hx	High estimate	\$2,400

$$\frac{[(400)^2 + (1600)^2 + (2400)^2] - (400)*(1600) - (400)*(2400) - (1600)*(2400)}{18} = 168889$$

The standard deviation represents the square root of the variance:

$$\partial(x2) = \sqrt{Var(x2)}$$

$$\partial(x2) = \sqrt{168889} = 411$$

The final calculation in our analysis is to create a measure for the impact of risk on the cost or benefit estimate. To do this, we use the following equation:

Risk impact: [(standard deviation of estimate)/ (unbiased estimate)] * 1/2

$$Risk\ impact = 1 - \left[\frac{[\partial(x2)]}{x2} \right] * \frac{1}{2}$$

The Total Economic Impact Of IBM Information Server

$$\text{Risk impact} = 1 - \left[\frac{411}{1600} \right] * \frac{1}{2} = 1 - 12.8\% = 87.2\%$$

The logic behind the equation for risk impact is as follows:

- We first divide the standard deviation into the unbiased estimate to get an estimate of the magnitude of the mean of the distribution to the possible spread of the distribution. This ratio allows us to compare the impact of risk multiple cost and benefit estimates by reducing them to a percentage.
- We next multiply the original ratio by $\frac{1}{2}$ to measure only the likelihood of the potential downside of the estimate. Multiplying by $\frac{1}{2}$ allows us to look at the part of the distribution where the likelihood that the costs will be higher than estimated (the right side of the distribution) or where benefits will be lower than originally estimated (the left side of a normal distribution).

The table below illustrates the progression of the original benefit estimate to the risk-adjusted benefit estimate, accounting for the impact of variance.

Impact of bias and risk	
Original estimate	\$2,000
Revised estimate	\$1,600
Risk-adjusted estimate	\$1,395