



The Total Economic Impact™ of Deploying the Sun-Sybase Enterprise Data Warehouse Reference Architecture

Project Director:

Chip Gliedman, Giga Vice President and Research Fellow

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Giga Information Group
Worldwide Headquarters
139 Main Street, 5th floor
Cambridge, MA 02142
Tel: 617-577-4900
Fax: 617-577-4901

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Executive Summary

Introduction

Sun Microsystems Inc. and Sybase Inc. commissioned Giga Information Group to examine the total economic impact of deploying the Sun-Sybase Enterprise Data Warehouse Reference Architecture (Sun-Sybase EDW RA), based on Sybase's Adaptive Server® IQ Multiplex™ enterprise analytical engine and the Sun Fire™ class servers, ranging from 4-cpu V480 server to 106-cpu F15K server, and Sun StorEdge Arrays, such as T3 arrays and SE 9x00 Series Data Center Storage Solutions, for data warehousing, business intelligence and analytics.

This report highlights the comparative benefits of deploying the Sun-Sybase EDW RA as demonstrated from the interviews and analysis of four organizations. The report examines the estimated return on investment (ROI) and represents the aggregate, composite findings derived from the interviews and analysis process, as well as the independent research of Giga Information Group.

Giga Information Group was selected for this project because of Giga's Total Economic Impact™ (TEI) analysis methodology, which 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.

Giga's Total Economic Impact™ (TEI) is a way of quantifying the full impact of a technology investment by considering four elements of any initiative:

1. Benefits
2. Costs (sometimes referred to as total cost of ownership (TCO))
3. Flexibility
4. Risk

Given the increasing sophistication that enterprises have regarding cost analysis related to IT investments, Giga's TEI methodology serves an extremely useful purpose by providing a complete picture of the total economic impact of purchase decisions.

Brief Description of the Sun-Sybase Enterprise Data Warehouse Reference Architecture

The Sun-Sybase EDW RA is a tested, tuned and documented implementation of the Sybase IQ Multiplex analytic engine, deployed on Sun servers and storage. Implementations can range from a single processor server, to servers with more than 100 processors. Combined, the technologies provide flexibility of configurations, reduced implementation risk and high performance.

While traditional databases store data in rows, Sybase IQ Multiplex (IQ-M) stores data in columns. Rather than expanding datasets to up to 10 times their original size, IQ-M often requires only a fraction of the original data size for storage. Additionally, the column-oriented structure reduces I/O, since relevant columns are loaded and sorted independent of irrelevant data. As a result, queries can run 10 to 100 times faster.

The Sun-Sybase Reference Architecture program codifies best practices for the implementation of these technologies so that clients benefit from previous knowledge and research to reduce time to implementation and project risk.

Summary Findings

Giga Information Group's research and our interviews with the four organizations shows that implementing the Sun-Sybase EDW RA solutions can provide significant benefits to organizations in four areas:

1. Improved decision-making using a single source of reliable information

2. Ability to perform data analysis of large datasets than was previously possible within these organizations
3. Reducing both the IT costs and the business unit costs of managing and maintaining the data warehouse and data
4. Increased IT and business flexibility through the ability to add and change database and server configurations, leading to faster and more inexpensive changes to the business queries and analytics

The summary findings based on the model of the composite organization are as follows:

- For our composite organization, the risk-adjusted three-year return on investment was 63 percent, and the non-risk-adjusted ROI was 78 percent (see Tables 1 and 2).
- The net present value (NPV) of the three-year, risk-adjusted cash outflows associated with implementing and maintaining this solution were \$2,470,321.
- The NPV of the three-year, risk-adjusted benefits associated with this solution were \$908,555 for the IT organization.
- The NPV of the three-year, risk-adjusted benefits associated with this implementation were \$3,125,762 for the business unit.
- Total value of the flexibility options created was \$641,778.
- Total risk-adjusted benefits, including flexibility benefits, were \$4,676,095.
- Risk-adjusted payback period was within 15 months.

Table 1: Composite Organization Financial Summary — Non Risk-Adjusted Values (000)

	Year 1	Year 2	Year 3	Total Cash Flow	NPV
IT Costs	\$ <1,767>	\$ <436>	\$ <480>	\$ <2,683>	\$ <2,390>
Business Costs	-	-	-	-	-
IT Benefits	\$ 218	\$ 436	\$ 480	\$ 1,134	\$ 956
Business Benefits	\$ 750	\$ 1,500	\$ 1,650	\$ 3,900	\$ 3,290
Flexibility Benefits	-	-	-	-	\$642
Net Value	\$ <799>	\$ 1,500	\$ 1,650	\$ 2,351	\$ 2,498
Non-risk-adjusted ROI	78%				
Payback Period	13 Months				
NPV Discount Rate	8%				

Source: Giga Information Group

Table 2: Composite Organization Financial Summary — Risk-Adjusted Values (000)

	Year 1	Year 2	Year 3	Total Cash Flow	NPV
IT Costs	\$ <1,825>	\$ <451>	<495>	\$ <2,772>	\$ <2,470>
Business Costs	-	-	-	-	-
IT Benefits	\$ 207	\$ 414	\$ 456	\$ 1,077	\$ 909
Business Benefits	\$ 712	\$ 1,425	\$ 1,568	\$ 3,705	\$ 3,126
Flexibility Benefits	-	-	-	-	\$642
Net Value	\$ <906>	\$ 1,388	\$ 1,529	\$ 2,010	\$ 2,207
Risk-adjusted ROI	63%				
Payback Period	15 Months				
NPV Discount Rate	8%				

Source: Giga Information Group

For our composite organization, the risk-adjusted payback occurred 15 months after the initial deployment. ROI was 63 percent on a risk-adjusted basis. When a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed since the risks that threaten the project have already been taken into consideration and quantified. From our composite research, we have discovered the following:

- Simply put, for every dollar invested in the Sun-Sybase EDW RA project, \$1.63 would be returned to the organization in direct cost savings or increased bottom-line profit as a result of increased business.
- Flexibility benefits for our composite organization during a three-year period were \$641,778. (The flexibility component of TEI captures that value using the industry standard Black-Scholes options valuation formula — see Flexibility section below for more information.)
- The composite organization, as well as all four of our interviewed organizations, found an expected return, even on a risk-adjusted basis, that exceeds the standard hurdle rate for technology investments of 30 percent on a non-risk-adjusted basis.

ROI will vary significantly from one organization to the next. Organizations should use Giga’s research as a guide in their decision-making process when considering this or any EDW solution.

Summary Conclusions

When an organization considers a capital investment, it must balance the potential return against risks that that return will be achieved. A completely risk-free investment, such as a government bond, can generate in the neighborhood of 2.5 percent per year of risk-free return. When considering competing investment opportunities, organizations often set a “hurdle rate” that the investment must exceed in order to balance increased risk. For short-term cash investments, financial officers might consider a hurdle rate of 5 percent on their investment to compensate for risk. Likewise, investment in capital improvements, such as plant upgrades, usually requires 10 percent to 15 percent expected returns to be justified. Giga Information Group finds that the IT expenditures often require an expected return of two to three times this rate, or about 30 percent, to be considered. The organizations interviewed by Giga Information Group all showed actual or expected returns on their investments in the Sun-Sybase Enterprise Data Warehouse Reference Architecture that ranged from 72 percent to 175 percent on a non-risk-adjusted basis and from 36 percent to 117 percent on a risk-adjusted basis. It is

clear that these companies found an expected return, even on a risk-adjusted basis, which exceeds the standard hurdle rate for technology investments¹.

While an enterprise data warehouse is not the panacea for all business ills, when there are defined business needs and clear actions that will result from its implementation, significant direct business benefits can be achieved. Using a subset of the results from the interviewed organizations Giga Information Group projects that a composite organization facing some of the same business and IT pressures will likewise achieve a return on investment greater than most standard IT hurdle rates and such an investment will pay back its investment in a period of between 13 and 15 months of use.

The ability to change business processes, product and service offerings, and IT configurations was also a key requirement for our interviewed organizations. The Sun-Sybase EDW RA — with its ability to process larger and more granular and comprehensive data sets with equal or better performance, and its flexibility to add columns to the database as business needs evolved, and to scale to meet user or service level needs — provided significant future benefits for these organizations.

While choice of business analytics engines and platforms were primarily made within IT, it is important to understand the potential benefits that accrue to the entire organization. In particular, the decision to implement a solution in this area must be embraced by the business users in order to accrue any or all of the potential business benefits.

As with any vendor solution, the risks of achieving increased efficiency, lower cycle times and increased performance and reliability must be measured and quantified. It is possible that the risk associated with the costs and benefits may lower the original benefits estimate significantly, potentially resulting in a minimal or negative ROI. It is therefore necessary to quantify all the risks related to cost and benefit estimates.

¹ Comparisons to hurdle rates are often done using non-risk-adjusted estimates, because the setting of the hurdle rate assumes the inherent risks to the investment and its benefits.

TEI Interview Highlights

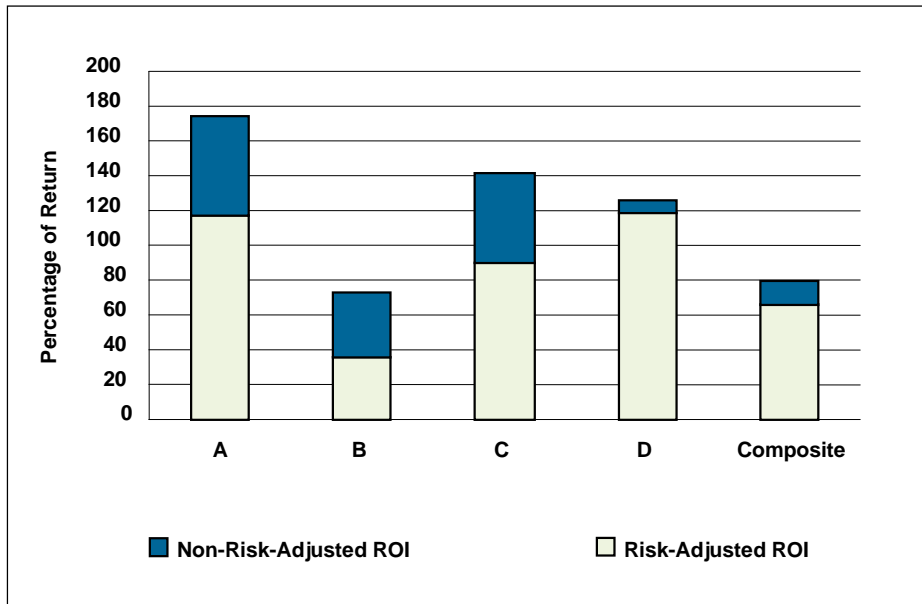
As previously mentioned, Giga’s TEI conclusions are derived in large part from information received in a series of interviews with executives and personnel at four organizations that have deployed the Sun-Sybase EDW RA solution.

Industries represented by these four organizations include: insurance, financial services, health care, electric utilities and telecommunications services. A brief description of each organization follows:

- A. A government agency chartered with the collection and dissemination of data, statistics and indices that aggregate and communicate trends in various areas
- B. A large North American data collection and syndication company providing consumer behavior information to media clients
- C. A medium North American data collection and syndication company providing consumer behavior information in the area of e-commerce to merchandizing clients
- D. A large North American financial institution and credit card issuer facing encroaching competition in its credit card business

A summary of the ROI projections and analysis for the four interviewed companies and the composite organization are summarized in Figure 1.

Figure 1: Return on Investment of Interviewed and Composite Organizations



Source: Giga Information Group

Giga observed several common characteristics across the organizations interviewed, despite their different business drivers and objectives. These common characteristics provide the initial building blocks in applying the costs and benefits of the Sun-Sybase EDW RA solution to a composite organization:

- Three of the organizations believe that the Sun-Sybase EDW RA solution reduced the risk to their revenue by preventing competition from entering their market segments. By using the Sun-Sybase EDW RA solution, they were able to either increase services or better understand the needs of their

customers. This revenue preservation was the key business driver for the Sun-Sybase EDW RA solution in these organizations.

- The decisions to use the Sun-Sybase EDW RA solution centered on the primary need for managing and analyzing large, changing data sets on an *ad hoc* basis. Three of the four organizations were unable to deliver the desired business solutions with installed database and data warehouse solutions on an economical basis prior to installing the Sun-Sybase EDW RA solution. The fourth chose the Sun-Sybase EDW RA solution to complement other instances of Sybase ASE databases within its organization.
- The majority of the organizations interviewed used the Sun-Sybase EDW RA solution to make data available to external users through an information portal or other fee-paid services. All expressed the belief that the data available in the Sun-Sybase EDW RA solution:
 - Was more timely: Prior implementations often aggregated weekly or monthly data. Current implementations used data on a much more granular and immediate basis.
 - Had fewer errors: Prior implementations often included multiple data sets that introduced errors in the data that required resources to correct.
- Most organizations interviewed noted that prior to the implementation, data warehouse and business analytics required more resources in a number of areas, while delivering less business functionality. The key areas of savings expressed by the interviewees included:
 - Reduced storage costs with storage requirements dropping by 50 percent to 75 percent for similar or larger datasets
 - Reduced DBA and programmer support requirements
 - Reduced training time
 - Reduced time and cost to implement changes to the database and to modify existing, or implement new queries
 - Savings to end users in terms of overall business process improvements

From these common value statements, Giga was able to extrapolate and generate a potential ROI for a composite organization whose business is threatened by competition and which must make improvements to product or service offerings as well as make more effective business decisions to protect and grow revenue, all the while continuing to face pressures on IT budgets and resources.

Interview Highlights — Organization A

This government agency is chartered to collect and make information available to other governmental agencies and departments, educators and researchers, and the public and press. Prior to the implementation of the Sun-Sybase EDW RA, the following business problems were evident:

- The agency was having difficulty meeting its legislatively mandated charter.
- Large queries could take three days to run, limiting the usefulness of the information and disincenting *ad hoc* queries and changes to existing queries.
- Multiple agencies maintained separate databases and support organizations to manage and maintain these databases, driving up costs and introducing errors into the systems.
- Information access was limited, since researchers seeking information from the agency were forced to submit requests by mail with a turnaround for service potentially approaching three months.

- The agency maintained a subscription service where 500 clients paid a yearly subscription fee to receive data.

Following the implementation, the following benefits were realized:

- Queries that previously required three days to run now were executed in seconds and minutes.
- Multiple agencies were able to consolidate databases, reducing costs to all and improving information breadth and quality,
- An information portal was created, allowing external researchers and the press to directly retrieve information.
- Information that was previously only available by subscription was now available at no charge, creating significant cost savings and additional value for the clients of the agency at least equal to their savings in subscription fees.

In addition to the direct benefits described, the organization was able to create future options in the following area:

- Cost to develop new price and behavior indexes are dramatically reduced, because these future products can be developed with a minimum of additional IT personnel or systems resources.

Table 3: Organization ‘A’ Financial Summary

Organization A	Industry: Government
ROI	175%
Risk-adjusted ROI	117%
Net Present Value (risk-adjusted)	\$ 3,042,278
Value of Options Created	\$ 577,584

Source: Giga Information Group

Interview Highlights — Organization B

This research and information syndication organization furnishing mass-market behavioral information to media organizations was facing the threat of competition in its core business. Prior to the implementation of the Sun-Sybase EDW RA, the organization:

- Faced exposure in its core business due to limits on the amounts, structure and granularity of the data available to its subscribers
- Had to manually identify and correct problems or errors in its historical data
- Was forced to impose “blackout windows” when data could not be read while the database was being updated
- Was limited in its ability to develop and release new syndicated products, due to inflexibility in the existing database

The organization responded by implementing the Sun-Sybase EDW RA to protect its revenue by:

- Increasing the detail and timeliness of data, approaching near real-time availability, with detail in 15-minute segments, rather than monthly, as was previously available

- Added 160 additional characteristics that can be used for search and analysis with the same or better performance
- Opened new revenue sources by allowing the development of new products and services

In addition, the organization reduced IT costs by:

- Consolidating data sources across multiple products into a single data source to reduce management, storage and processing costs

The organization also stated that it has gained options in the following areas:

- Ability to add new products and users at 40 percent to 50 percent of the previous costs due to the multiplexing functionality available
- Develop new products and services at a greatly reduced cost, turning some previously uneconomical product opportunities into potentially profitable ones

The organization believes that, as a result of the implementation, the potential competitor has abandoned its attempts to enter this market and that new revenue opportunities that could greatly increase revenue in this product area are now present.

Table 4: Organization ‘B’ Financial Summary

Organization B	Industry: Research and Information Provider
ROI	72%
Risk-adjusted ROI	36%
Net Present Value (risk-adjusted)	\$ 3,824,559
Value of Options Created	\$ 806,249

Source: Giga Information Group

Unlike the other organizations interviewed, this institution had higher-than-anticipated costs to implement the Sun-Sybase EDW RA. Giga Information Group believes that this is directly attributable to the installation of a storage area network (SAN), the cost of which was borne by the data warehouse project and was not anticipated in the initial cost estimates. As a result, this organization showed a somewhat lower return on investment than the other organizations interviewed, though the final results still exceeded expectations.

Interview Highlights — Organization C

This research and information syndication organization in the area of e-commerce was projecting a 75 percent decrease in revenues in one product area in the coming three years due to the capabilities of existing systems. The company felt it had to react to the changing and growing demands of the marketplace to retain this revenue. Prior to the implementation, the organization was faced with:

- Severe difficulty keeping up with the growing and changing needs of its clients, which put significant revenue at risk
- Only being able to provide monthly data sets to clients
- Growing demands for IT resources to support and maintain the growing database installations
- Limited ability to develop new surveys and questionnaires due to inflexibility of the databases

Following implementation, the organization believes:

- It has successfully prevented the expected decline in the revenue stream.
- It was able to offer near-real-time data availability to its clients, moving from monthly data sets to almost immediate access to data as it was collected.
- It has reduced the number of IT support staff by 50 percent while providing better performance and greater query flexibility.
- It has reduced the number of business analysts by two-thirds while maintaining or improving the information access of its clients.
- It can now develop and deliver new surveys and questionnaires quickly and inexpensively to meet customer needs, since the database can be modified to support new data schemas.

The organization had identified and evaluated two vendor offerings it believed would solve the approaching business problem and selected the Sun-Sybase EDW RA. Key among the reasons for the selection of the Sun-Sybase solution, as described by the client, was the reduction in risk inherent with the selection. The organization expressed reservations that a competing data warehouse vendor would be able to provide a comparable level of service and that implementation costs or future maintenance cost estimates would be less predictable and at risk.

Table 5: Organization ‘C’ Financial Summary

Organization C	Industry: Research and Information Provider
ROI	141%
Risk-adjusted ROI	90%
Net Present Value (risk-adjusted)	\$ 1,100,694
Value of Options Created	\$ 127,728

Source: Giga Information Group

Interview Highlights — Organization D

This North American financial institution was likewise facing external threats to a key credit card line of business. Rather than cede the market to a larger competitor, the organization chose to fight to retain the business with a number of initiatives centered on knowing and servicing its customers better. The Sun-Sybase EDW RA was selected to support the business intelligence aspects of this initiative. Since this initiative has been under way for more than three years, the return on investment analysis reflects that amounts spent for the solution and the benefits achieved. Unlike the previous three organizations that have achieved some of the results and are projecting the coming benefits over three years, this organization’s ROI reflects the previous three years of use and benefits.

Prior to the implementation, cardholder market share had declined an average of 0.7 percent per year for three years. Following the implementation, the organization stated, “Information management has fundamentally changed the way we do business.”

Table 6: Organization ‘D’ Before and After Summary

Before [1992-1995]	After [1997-2000]
Mass Marketing	Micro Marketing
Portfolio Management	Account Management
Product Pricing	Account Pricing
Product Profitability	Account Profitability
Mass Service	Personal Service
Below Average Profitability	Superior Profitability

Source: Organization “D”

In the period from 1997 to 2000, the following improvements in this business were achieved:

- Cardholder dollars outstanding increased by 300 percent.
- Cardholder dollar volume increased by 100 percent.
- Profit contribution more than doubled from 9 percent to 22 percent.

Additionally, this organization created a number of business options, which it is in the process of exercising, including:

- Creation of a development and test environment that can serve as a business continuity platform for other systems, since the platform is based on standard Sun hardware and the Solaris operating system
- Load balancing and flexible scaling, due to the ability to size servers based on user needs and the appropriate service-level requirements

Table 7: Organization ‘D’ Financial Summary

Organization D	Industry: Financial Services
ROI	126%
Risk-adjusted ROI	118%
Net Present Value (risk-adjusted)	\$ 7,797,439
Value of Options Created	Not quantified

Source: Giga Information Group

Findings and Analysis — Composite Organization

Description of Composite Organization

Although the organizations interviewed were in different industries and were of different sizes, there were common characteristics. From the similarities noted, a composite organization was created that had the following characteristics:

- The organization is currently running a data warehouse application on another product with approximately 1.5 terabytes of data.
- Query processing time is now into days for complex queries against the whole database.
- Aggregated data, rather than discrete data, is predominantly used as the source for most queries.
- The company is facing changing business needs and pressures that are putting approximately \$10 million of business revenue at risk.
- The current database schema does not allow for flexibility and easy modifications.
- There are approximately four IT personnel supporting the hardware, software and storage needs of the current installation.

From this set of characteristics, Giga Information Group projected the impact of implementing the Sun-Sybase EDW RA at this organization. Changes to the revenue stream of the organization, IT costs, options and flexibility were estimated. Risk factors that would cause the actual results to vary from these estimates were considered.

Benefits and Savings Opportunities of Implementing Sun-Sybase EDW RA

For the composite organization, the following assumptions regarding the benefit estimates were made:

- The company is using the Sun-Sybase EDW RA solution to process large amounts of business data. This data will either be used by internal employees with direct impact on the organization's revenues, or the information stored will be made available externally. For our composite organization, the business goal is to protect \$10 million in revenue per year during the three-year analysis cycle.
- The data warehouse implementation will be based on this goal, and the key business benefit is the preservation of \$10 million in gross revenue per year.
- Projected gross revenue benefits were decreased by 85 percent (0.85) in this analysis to represent the business overhead and a 15 percent (0.15) net margin. While \$1 in savings is likely to show up as \$1 in profits, \$1 in revenue will only generate approximately \$0.15 in profit, due to the cost of goods sold, customer acquisition and maintenance costs, and other business overhead.
- Revenue benefits will accrue beginning about six months into the project. During the first year, approximately 50 percent of an annual benefit will accrue, with full years of benefits in years two and three.

In addition to a revenue benefits, there were substantial internal IT cost savings with the new data warehouse environment. Based on the analysis of the interviews with the different organizations, there were significant cost efficiencies as a result of the implementation of the Sun-Sybase EDW RA solution. Improved cost efficiencies were seen in several areas:

- Companies interviewed stated there were significant improvements in terms of daily maintenance of their data warehouse environment. These included costs for regular maintenance and support of the environment. For the purpose of the composite company, Giga estimates daily maintenance and support personnel would be reduced by 50 percent compared to the previous environment. Based on the previous resource requirements, this would translate into roughly \$256,000 in savings in year two and \$281,600 in year three for our composite organization.
- As stated above, the users of the Sun-Sybase EDW RA solution stated they were able to operate their business analytics with reduced hardware, software and storage as a result of the performance they found. While savings in the cost of the hardware and software required to implement the solution are reflected in the cost analysis above, there is also a decrease in the ongoing maintenance and support burden for the production solution. Based on the interviews, Giga Information Group estimates that the savings in maintenance and support for the hardware and software will be approximately 50 percent or \$378,000 total for years two and three of the business analysis for our composite organization.

Costs to Implement the Sun-Sybase EDW RA

Costs, or IT impact, are calculated as a change in costs primarily to IT as a result of the introduction of the technology to the given organization. Therefore, the purchase of the Sun-Sybase EDW RA solution initially affects IT costs negatively, because the implementation requires incremental spending. This is offset by future spending reductions in hardware, software and personnel resources needed to store and manage the data warehouse. All of the companies interviewed indicated that once a production state was achieved, the ongoing costs to provide access to more data, greater flexibility in analysis, as well as increasing service levels, as measured by the time it took queries to execute, was 30 percent to 50 percent lower than with their previous data warehouse implementations.

The impact of cost is accrued in several areas:

- Hardware, software and storage combination costs represent the largest investment in the Sun-Sybase EDW RA implementation. For the purpose of the composite organization, hardware, software and storage costs were combined, since all of the interviewed companies treated the acquisition of the solution as the purchase of a combined entity that was designed to work as a unit. The cost estimate assumes that the organization used the Sun-Sybase EDW RA solution to store and manage approximately 1.5 terabytes of non-compressed business data to be accessed by 20 internal users, which would require approximately 1 terabyte of online storage. The cost estimate (non-risk-adjusted) for hardware, software and storage is \$1,200,000².
- These costs would be incurred in the first year of the three-year business cycle.
- Ongoing maintenance costs for the hardware, software and storage costs are estimated at \$180,000 per year for the second year of the three-year business cycle³ and \$198,000 for the third year⁴.
- Personnel costs for the implementation are estimated at \$567,000 representing 4.5 full-time equivalent programmers, systems engineers, etc. during a one-year implementation cycle at a fully

² Hardware, software and storage costs for interviewed companies ranged from \$330,000 for an organization with approximately 0.5 terabytes of data to \$3,960,000 for an organization with 4 terabytes of data and redundant systems. Costs to implement will vary greatly depending on the need to implement a storage area network as a prerequisite to the Sun-Sybase EDW RA solution.

³ Interviewed companies are spending or budgeting between 12 percent and 18 percent of purchase prices for maintenance for the hardware, software and storage.

⁴ Third-year costs are based on estimated second-year costs with a 10 percent annual cost escalation.

burdened cost to the organization of \$126,000 per year⁵. These costs will be incurred in the first year of the three-year business cycle.

In addition to direct hardware and software costs, the impact to labor resources was also factored into the overall model. Labor costs were examined from three perspectives: changes in costs related to training, maintenance and operations as well as any additional internal support costs above and beyond the cost of technical support. Training costs relate to the cost to train the administrators on the new technology from the previous environment. Based on the data received from the interviews, the amount of training costs are dependent on the configuration of the previous environment, the size of the installation, and the level of technical familiarity with Sun hardware and Sybase database technology. For the composite organization, Giga estimates the cost to train would be negligible, provided that the organization had Sun hardware and Sybase software installed. However, this represents a positive impact on the IT budget, since most specialized data warehouse implementations would require an estimated 10 days of training per IT staff person at an estimated cost of \$5,000 per person. Overall, the organizations interviewed stated the cost of training was minimal compared to the cost of the solution and this amount was used for our composite organization.

Flexibility Associated With Sun-Sybase EDW RA Implementations

Flexibility, as defined by TEI, represents the value of the options created by the technology platform. When one considers an investment, one can look at both the immediate benefits and the possibility of adapting that investment to meet unanticipated or potential needs. For example, if one buys a house, one will receive the benefit of living in it. If the house that was purchased can also be expanded to meet a changing family need, that extra option is of value to the original purchaser and makes the house more valuable than just the direct benefits imply. TEI attempts to put a value on these options, since they represent an additional asset that the organization has obtained as a result of implementing the basic technology platform.

In the case of the Sun-Sybase EDW RA, the interviewed organizations stated that they had obtained the following future options as a result of their implementations:

- They could react quickly to changing needs in their businesses, because the database schema could be easily modified and an almost unlimited number of new columns could be added.
- They could change their queries, since the database stored discrete data elements, as opposed to aggregated data. This allowed them to perform new queries without having to rebuild the database and the indices.
- They could scale the number of users quickly, adding appropriate new servers to handle the needs of the new users without having to move or modify the existing users' configurations.

These benefits could be turned into additional business benefits, depending on the future business needs of the organization.

The value of flexibility is clearly unique to each organization, and the willingness of each organization to measure the value of flexibility varied considerably from organization to organization. For the purpose of this analysis, we have assumed that the composite organization sees the value of flexibility in the ways described above.

With any option, just as with the example of the option to expand a house, taking advantage of these options will require a second investment. We can estimate this cost and use it to value the options created, as with the value of the new house, or the additional business produced by the option.

⁵ Fully burdened rate is based on an average salary of \$90,000 per year with a 40 percent added for taxes, benefits and overhead costs.

Likewise, if the second investment is not made, due to business conditions not being in favor of the option's exercise, the option on flexibility will "expire" worthless. For the purpose of analysis here, two budget cycles, or two years, is often used as a good first step in looking at this expiration date for the option. The fact that this secondary project may or may not be funded in two budget cycles is reflected in the value of the option benefit.

Lastly, to value the option, we must consider the base value of money — which is reflected in the risk-free rate of return on capital — and the volatility or uncertainty about future conditions and needs. If an organization has clarity about future and there is little or no volatility, then a financial analysis of future spending becomes a net present value calculation. If there is uncertainty, then purchasing or obtaining options to hedge future business risks creates added value.

For the composite organization, Giga Information Group used the following inputs into the options pricing formula:

- Business value that will result from the exercise of the option: \$1,000,000
- Cost to exercise the option (available once the technology platform is installed): \$500,000⁶
- Time until the option expires (if not used): two years
- Risk-free rate of return: 4 percent
- Volatility of the marketplace and uncertainty about future business needs: 0.6

The underlying value of the option is estimated to be \$641,778 (using non-risk-adjusted inputs), based on the Black-Scholes Option Pricing formula. For additional information regarding the flexibility calculation used, see Appendix A.

Risks Associated With Estimates of Costs and Benefits

Risk-adjusted and non-risk-adjusted ROI are both discussed in this study. The assessment of risks provides a range of possible outcomes, based on the risks associated with IT projects in general and specific risks relative to data warehouse projects. In our research, Giga Information Group discovered that implementing the Sun-Sybase EDW RA was a relatively low-to-medium risk endeavor, as expressed by the interviewed organizations.

Risk factors are used in TEI to widen the possible outcomes of the costs and benefits (and resulting savings) associated with a project. Since the future cannot be accurately predicted, there is risk inherent in any project. TEI captures risk in the form of risks-to-benefits and risks-to-costs.

The following *general* risks were considered in this report:

- Lack of corporate discipline in creating processes and procedures to best take advantage of the benefits
- Lack of appropriate training for IT and end-user personnel who will be responsible for achieving and optimizing the benefits from the installed data warehouse
- Failure to reduce, transfer or redeploy IT support and business unit headcount made redundant by implementing the Sun-Sybase EDW RA

⁶The ability to spend \$500,000 to exercise this option and acquire the business value is only available once the platform is installed. Without the platform, the spending required to produce this business value is likely closer to \$1,000,000 or \$1,200,000, based on the interviewed organizations.

- Internal inertia, conflicting priorities and turnover, reducing the organization’s ability to achieve the benefits

The following risks associated with general data warehouse implementations were considered in this report:

1. There is a risk that costs will be greater than anticipated. Experience indicates that project size will be a significant risk factor for cost. Data warehousing projects are notoriously large in scope and scale. Buying a prepackaged data warehouse solution may be a means of partially mitigating this risk.
2. There is a risk that benefits will not be realized on schedule due to the size of the project.

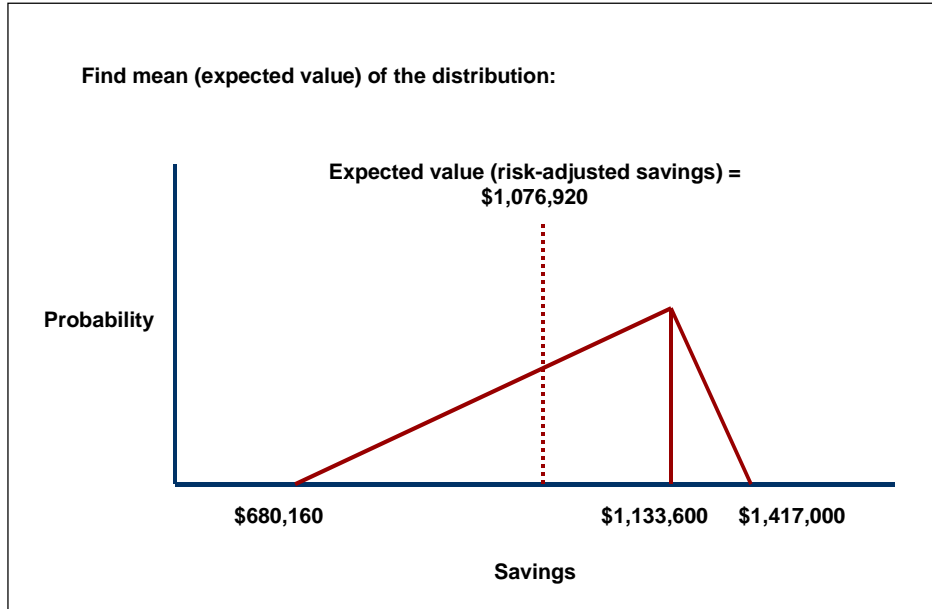
If a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed since the risks that threaten the project have been taken into consideration and quantified. The risk-adjusted numbers should be taken as “realistic” expectations, since they represent the expected value considering risk. Assuming normal success at mitigating all risk, the risk-adjusted numbers should more closely reflect the expected outcome of the investment.

For our composite organization, Giga applied low-to-moderate risk factors to each cost and benefit. As an example, we will show the risk calculation for the cost savings benefits for the Sun-Sybase EDW RA.

Risk Calculation Example

Risks-to-benefits considers all possible risks to each benefit. (Likewise, risks-to-costs considers all possible risks to each cost.) Using probability density functions, we create a triangular distribution range of three values, including a low estimate, a most-likely estimate and a high estimate. For example, in our composite organization, we included a risk adjustment for IT cost savings of \$1,133,600 (non-risk-adjusted). For this savings category, the risks-to-savings ranged from a low estimate of 60 percent of the \$1,133,600 (\$680,160), suggesting an inability to realize 100 percent of the savings, to a high of 125 percent (\$1,417,000), indicating a possible slight overachievement of the savings. Using triangular distribution, we sum the three possibilities of low, most likely and high and divide by three to get the mean (or risk-adjusted cost savings) of \$1,076,920 ($\$680,160 + 1,133,600 + \$1,417,000 = \$3,228,960 / 3 = \$1,076,920$). Figure 2 illustrates the concept of triangular distribution, and the vertical line in the center represents the expected value of \$1,076,920. In our composite organization, all costs and benefits were adjusted for risk.

Figure 2: Risk Adjustment Calculation Example



Source: Giga Information Group

For our composite organization, the following values were used in the risk-adjustment calculations (see Appendix B for specific detail on the risk-adjustment calculations):

- Risks to Costs:
 - Best Case values are 90 percent of the non-risk-adjusted cost estimates.
 - Worst Case values are 120 percent of non-risk-adjusted cost estimates.

- Risks to Benefits:
 - Best Case values are 125 percent of the non-risk-adjusted benefit estimates.
 - Worst Case values are 60 percent of non-risk-adjusted benefit estimates.

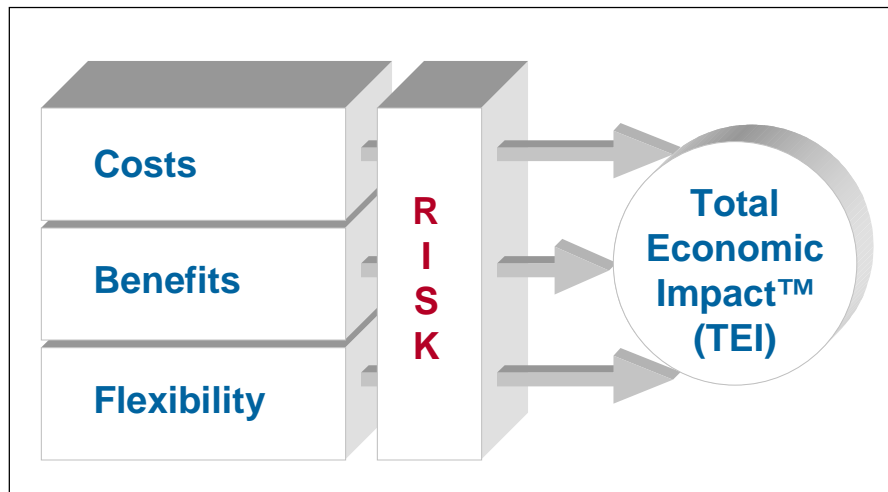
Appendix A: Total Economic Impact™ Primer

Total Economic Impact™ is primarily a common language tool, designed to capture and properly communicate the value of IT initiatives in a common business language. In so doing, TEI considers four elements of any initiative:

1. Benefits
2. Costs (sometimes referred to as total cost of ownership (TCO))
3. Flexibility
4. Risk

Figure 3 shows the TEI methodology conceptually. Benefits, flexibility and costs are considered, through the filter of risk assessment, in determining an expected ROI for any given initiative.

Figure 3: TEI Conceptual Diagram



Source: Giga Information Group

Benefits

Benefits represent the *value* delivered to the business by the proposed project. Oftentimes, IT project justification exercises focus on cost (e.g., TCO) and cost reductions. Among industry leaders, IT is deployed as an offensive weapon, with value expectations greater than simple cost reduction, especially when those cost reductions tend to focus within IT. TEI captures the value proposition of the proposed project by measuring the benefits against the incurred costs.

All benefits captured by TEI must be traceable back to one or more critical success factors (CSFs). These CSFs are directly linked to a higher-level business strategy. If a proposed technology investment generates benefits that cannot be satisfactorily linked to a CSF, then it will not be included as a benefit for the organization in the model. In these cases, TEI requires that the benefit be discarded.

Under TEI, benefits may only accrue to the business units. “Benefits” derived through cost reductions within IT accrue as negative TCO to the IT budget, thereby showing a reduced TCO. (TCO is considered by TEI to be a single-dimension, cost-centric focus on the IT budget.)

The TEI process begins with a discovery of potential benefit areas. A representative from the organization under examination who has the ability to capture the benefit in question must validate each benefit captured during discovery. In other words, values cannot arbitrarily be assigned to a benefit if that person is not in a position to deliver that benefit should the project be approved. Additionally, projects that are expected to deliver business value require some effort on the part of the business to realize that value. That effort may be in the form of training, organizational change or a modification of existing business processes. Therefore, TEI requires dialog with the business leaders actually responsible for making the necessary changes, in order to capture the proposed benefit during the justification phase. TEI captures this dialog in the form of the names of the individuals, which validates the value calculation of each benefit.

Within TEI, each benefit entered has a specific capture date. Although the benefit may be captured over time, TEI requires the specification of a date when most of the benefit has been captured. TEI will then place the value delivered in the appropriate time frame within the project.

Costs

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs. These may be in the form of fully burdened labor, subcontractors or materials. Additionally, costs consider all the investment and expenses necessary to deliver the value proposed.

Flexibility

Flexibility, as defined by TEI, represents investing in additional capacity that can, for some future additional investment, be turned into business benefit — for instance, an investment in an enterprisewide upgrade of the desktop word processor application where the primary driver may be standardization (to increase efficiency) and licensing (to decrease IT costs). However, a collaborative workgroup feature may translate into greater worker productivity when the organization is ready to absorb the discipline necessary to capture that benefit. The collaboration feature does not promise benefit during this phase of the project and must be captured later, incorporating additional investment, most likely in the form of training. However, the existence of the option has a present value that can be estimated. The flexibility component of TEI captures that value.

Flexibility can also be calculated by acknowledging that management has several decision points along the way for any given project. At each point, management can steer the project to a different outcome or cancel it altogether. Many net present value evaluations fail to take this management flexibility into account. Since TEI's flexibility component uses the industry standard Black-Scholes options formula, the management flexibility factor is taken into consideration.

TEI divides a project into multiple phases. The first phase is considered the “benefits” phase — it is the phase expected to deliver the primary benefits. The benefits phase is usually no more than one budget cycle long and is the primary reason the project is being considered. All other phases are “options” or “flexibility” phases. For additional investment at some point in the future, business benefit can be captured during these “options” phases. TEI applies the Black-Scholes options pricing equation to all phases other than the benefits phase. The Black-Scholes equation uses five inputs to calculate the present-day value of flexibility or options:

1. The value, or business benefit, that can be captured when the option is exercised; this value is expressed in present value terms.
2. The time, to the date, at which point the option or flexibility expires. Expiration could be due to business changes or technology obsolescence.
3. The cost of the investment to exercise the option and capture benefit.
4. The risk-free interest rate (typically, the interest rate of government securities is used).
5. The volatility of the industry or sector; TEI uses the volatility of the stock prices within the market sector as this input.

Risk

Risks are used to widen the possible outcomes of the project. Since the future cannot be accurately predicted, there is risk inherent in any project. TEI captures risk in the form of risks-to-benefits and risks-to-costs.

Risks-to-benefits considers all possible risks to each possible benefit. Likewise, risks-to-costs considers all possible risks to each possible cost. Then, a range is chosen by applying best judgment for each cost and benefit, based on the set of risks assigned to each cost and benefit. The range is entered in the form of a low estimate, a most likely value and a high estimate. For example, the risks to a cost may result in a range from the expected value as the low estimate, to two times the expected value as the high for a particular cost (representing a potential two times cost overrun).

TEI applies a probability density function known as “triangular distribution” to the values entered. The expected value — the mean of the distribution — is used as the risk-adjusted cost or benefit number. The risk-adjusted costs and benefits are then summed to yield a complete risk-adjusted summary and ROI.

Typical project risk factors to consider include the following:

- *Vendors*: The risk that the vendor of a product or technology may need to be replaced at some point during the project duration
- *Products*: The risk that a product will not deliver the functionality expected
- *Architecture*: The risk that the current product architecture will not allow future infrastructure decisions and changes
- *Culture*: The risk that an organization will be unable to absorb the new technology or adapt to its implementation
- *Delays*: The impact on revenues of a project delay or cancellation
- *Size*: The direct correlation of project risk to the size of the project, as measured by application size or budget

Appendix B: Composite Organization TEI Analysis Financial Details

Table 8: Composite Organization Financial Details — Non-Risk-Adjusted Values (000)

Composite Organization — Details						
NPV Discount Rate		8%				
Costs	Year 1	Year 2	Year 3	Total	NPV	
Hardware/Software	\$ 1,200,000			\$ 1,200,000	\$ 1,111,111	
Maintenance and Support		\$ 180,000	\$ 198,000	\$ 378,000	\$ 336,420	
Internal Staff Costs	\$ 567,000	\$ 256,000	\$ 281,600	\$ 1,104,600	\$ 968,022	
Total	\$ 1,767,000	\$ 436,000	\$ 479,600	\$ 2,682,600	\$ 2,390,633	
Benefits	Year 1	Year 2	Year 3	Total	NPV	
Reduced Maintenance	\$ 90,000	\$ 180,000	\$ 198,000	\$ 468,000	\$ 394,833	
Reduced Administration	\$ 128,000	\$ 256,000	\$ 281,600	\$ 665,600	\$ 561,540	
IT Savings Total	\$ 218,000	\$ 436,000	\$ 479,600	\$ 1,133,600	\$ 956,374	
Business Benefit	Revenue Increase	\$ 5,000,000	\$ 10,000,000	\$ 11,000,000		
	x.15 net margin	\$ 750,000	\$ 1,500,000	\$ 1,650,000	\$ 3,900,000	\$ 3,290,276
Total Benefits	\$ 968,000	\$ 1,936,000	\$ 2,129,600	\$ 5,033,600	\$ 4,246,649	
Return on Investment						78%

Table 9: Composite Organization Financial Details — Risk-Adjusted Values (000)

Risk Adjustments Detail:					
Costs					
Best Case Value is	90% of Expected Value				
Worst Case Value is	120% of Expected Value				
Risk-adjusted Cost is: (Best + Expected + Worst) / 3					
	Year 1	Year 2	Year 3	Total	NPV
Hardware/Software	\$ 1,240,000	\$ -	\$ -	\$ 1,240,000	\$ 1,148,148
Maintenance and Support	\$ -	\$ 186,000	\$ 204,600	\$ 390,600	\$ 321,883
Internal Staff Costs	\$ 585,900	\$ 264,533	\$ 290,987	\$ 1,141,420	\$ 1,000,289
Total	\$ 1,825,900	\$ 450,533	\$ 495,587	\$ 2,772,020	\$ 2,470,321
Benefits					
Best Case Value is	125% of Expected Value				
Worst Case Value is	60% of Expected Value				
Risk-adjusted Cost is: (Best + Expected + Worst) / 3					
	Year 1	Year 2	Year 3	Total	NPV
Reduced Maintenance	\$ 85,500	\$ 171,000	\$ 188,100	\$ 444,600	\$ 375,091
Reduced Administration	\$ 121,600	\$ 243,200	\$ 267,520	\$ 632,320	\$ 533,463
IT Savings Total	\$ 207,100	\$ 414,200	\$ 455,620	\$ 1,076,920	\$ 908,555
Business Benefit	\$ 712,500	\$ 1,425,000	\$ 1,567,500	\$ 3,705,000	\$ 3,125,762
Total Benefits	\$ 919,600	\$ 1,839,200	\$ 2,023,120	\$ 4,781,920	\$ 4,034,317
Risk-Adjusted Return on Investment					63%