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Total Economic Impact™ Of
SQL Server 2008 Upgrade

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Executive Summary

In August 2008, Microsoft Corporation commissioned Forrester Consulting to examine the total economic impact and potential return on investment (ROI) enterprises might realize by upgrading from SQL Server 2000 or 2005 to SQL Server 2008. SQL Server 2008 offers many features that improve the performance, administration, integration, security and availability of SQL Server databases. In addition, it increases the productivity of Database Administrators (DBA) and developers to better manage and exploit data stored in SQL databases. This study illustrates the financial impact of upgrading from a previous version of SQL Server to SQL Server 2008.

Conducting in-depth interviews with an existing SQL customer that upgraded to SQL Server 2008, Forrester found that the organization achieved benefits, some easily measured for this ROI study and others, equally as valuable, that could not be quantified. Specifically, the benefits fall into the following categories: 1) avoided adding SQL Server 2008 servers – license and hardware savings; 2) avoided adding storage; 3) eliminated third-party software; 4) avoided hiring additional IT employees; 5) increased user productivity – business and IT; 6) improved database performance and provided enhanced features; 7) improved data security; and 8) improved working experience for the database administration team. Only the first five benefits were quantified as part of the ROI analysis. To fully understand the potential effect on their organizations, readers should consider all benefits, whether or not they could be quantified for this study.

This customer provided metrics to quantify components of the first five benefits listed above. For the interviewed customer, Forrester found that upgrading to Microsoft's SQL Server 2008 delivered an anticipated ROI of between 162% and 181%.

Purpose

The purpose of this study is to provide readers with a framework for evaluating the potential financial impact on their organization of upgrading from a previous version of SQL Server to SQL Server 2008. Forrester's aim is to clearly show all calculations and assumptions used in the analysis. This study shows all related costs, whether or not they are incremental to the new solution, to best give readers a complete understanding of the costs their organizations might incur. Readers should employ this study to better understand and communicate a business case for upgrading to SQL Server 2008.

Methodology

Microsoft selected Forrester for this project because of its industry expertise in database technologies and Total Economic Impact™ (TEI) methodology. TEI not only measures costs and cost reduction (areas 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 SQL Server 2008:

1. Costs and cost reduction.

2. Benefits to the entire organization.

3. Risk.

4. Flexibility.

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

Approach

A four-step approach was used for this study:

1. Forrester gathered data from existing Forrester research relevant to SQL Server 2008 and the database market in general.

2. Forrester interviewed Microsoft's marketing and sales personnel to fully understand the potential (or intended) value proposition of SQL Server 2008.

3. Forrester conducted a series of in-depth interviews with one organization that has upgraded to SQL Server 2008.

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

Key Findings

Forrester's study yielded the following key findings:

- **ROI.** Based on the interviews with an existing customer, Forrester constructed a TEI framework and performed the associated ROI analysis to illustrate the areas of financial impact. As seen in Table 1, the risk-adjusted ROI for this company is 162% with a break-even point (payback period) of six months after deployment.

- **Benefits.** As discussed previously, not all benefits associated with upgrading to SQL Server 2008 could be quantified for this study. For purposes of this ROI analysis, only benefits associated with avoiding additional SQL Server licenses and related hardware, removing third-party software, and employee savings and productivity were calculated. The risk-adjusted, present value of the benefits for the organization amount to $3.1 million over a three-year period.

- **Costs.** The customer interviewed for this study has Software Assurance for all of its SQL Server licenses, which enabled it to upgrade without paying for new licenses Therefore, the costs described in this study are for an existing user of Microsoft SQL Server that has invested in Software Assurance. If a reader's organization does not meet these two criteria, the cost of adding licenses in addition to the other costs contained in this study must be taken into consideration. The risk-adjusted, present value of the costs to the organization amount to $1.2 million over a three-year period.

Table 1 illustrates the original and risk-adjusted financial results for this customer based on data and characteristics obtained during the interview process. Forrester risk-adjusts these values to account for 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 might later affect the original cost and benefit estimates. Although the total cost and benefit values will vary by organization, the ROI and payback period should

accurately represent an anticipated result across a wide range of organizations. For a more in-depth explanation of risk and risk adjustments used in this study, please see the Risk section.

Table 1: Company ROI, Original And Risk-Adjusted

Summary financial results	Unadjusted (Best case)	Risk-adjusted
ROI — three-year	181%	162%
Payback (months)	Four	Six
Total three-year costs (PV)	$1,173,554	$1,174,750
Total three-year benefits (PV)	$3,293,133	$3,072,725
Total three-year net savings (NPV)	$2,119,579	$1,897,976
Internal rate of return (IRR)	701%	587%

Source: Forrester Research, Inc.

Disclosures

The reader should be aware of the following:

- The study is commissioned by Microsoft Corporation and delivered by Forrester Consulting.

- Microsoft Corporation 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 contradicted Forrester's findings or obscured the meaning of the study.

- The customer name for the interviews was provided by Microsoft Corporation.

- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers use their own estimates within the framework provided in the study to determine the appropriateness of an investment in upgrading to SQL Server 2008.

- This study is not meant to be used as a competitive product analysis.

Microsoft's SQL Server 2008: Overview

According to Microsoft, SQL Server 2008 is a secure, scalable, and manageable platform to support business critical applications. It offers a host of new database features including resource governor, data compression, transparent encryption, comprehensive auditing and enhanced mirroring. SQL Server 2008 enhances DBA productivity by allowing management of many databases through the policy-based management feature. It also simplifies development of data driven applications with tighter integration of Visual Studio and .NET Framework and support for all data types. SQL Server 2008 enhances information delivered to business users through advanced visualizations capabilities, powerful reports and integrated analysis.

Microsoft Software Assurance is a comprehensive maintenance offering that combines the latest software upgrades with telephone support available 24 hours a day, partner services, training, and IT tools to help customers deploy, manage, and migrate software. Software Assurance can be added at the time of purchase or, if the purchase is through an original equipment manufacturer (OEM), within 90 days.

Analysis

As stated in the Executive Summary, Forrester took this multistep approach to evaluate the effect of upgrading to SQL Server 2008:

- Interviews with Microsoft marketing and sales personnel.

- In-depth interviews with one organization that has upgraded to SQL Server 2008.

- Construction of a financial framework for the upgrade to SQL Server 2008.

Interview Highlights: Healthcare System

The customer interviewed for the TEI study was a healthcare system that operates four hospitals and other medical facilities. It has approximately 12,000 employees, holds more than two million patient records, and handles approximately 500,000 SQL Server database queries per day. The main reasons this customer upgraded to SQL Server 2008 were to take advantage of new features, lower database platform cost, improve performance and availability, and enhance productivity of DBAs and other employees.

The interviews with the leader of the database management team uncovered the following relevant points:

- This customer evaluated the new features available in SQL Server 2008 and decided that they were important to have as quickly as possible. The features found to be most valuable were Resource Governor, Policy Management, and Backup Encryption. The customer decided to proceed with the upgrade without undertaking any type of cost benefit analysis.

- Prior to upgrading, the customer was primarily using SQL Server 2005, but there were several applications still running on SQL server 2000 environment. The customer had paid for Software Assurance for all of its existing SQL Server licenses, which enabled it to upgrade without incurring additional license costs.

- This customer is taking advantage of the increased performance of SQL Server 2008 to complete a server consolidation project. The number of existing SQL Server licenses is expected to be sufficient for at least the next three years despite increasing workload and deployment of databases.

- This customer participated in the testing phase of Microsoft's launch of SQL Server 2008. Testing was begun in spring 2007 and the first production environment went live in December 2007. In all, twelve databases and nine applications had been completely migrated by the time this study was written. All instances of SQL Server and related applications are scheduled to be migrated to SQL Server 2008 by the end of 2009.

- According to the leader of the database management team, they found the upgrade to be simple and "was comfortable going live with SQL Server 2008 because of the complete support from Microsoft. Microsoft did a great job of training with a lot of demonstrations." He went on to described the process as "painless" overall.

- He also observed that "the most challenging part was understanding the new features, how Policy Management and Resource Governor work, and how to configure the new solution." He found there was a short learning curve associated with these features.

- The IT team proactively engaged the business users to explain the benefits that would be realized and worked with them to make the transition as smooth as possible. The interviewee remarked that business users "are happy and have had no complaints."

- This customer has seen a big improvement in meeting Health Information Portability and Accountability Act (HIPAA) compliance by being able to keep track of who accessed and changed data stored in SQL Server databases by using SQL Auditing.

- This customer has seen a 25% improvement in query response time without any changes in hardware, database or application. Business users have noticed this improved performance.

TEI Framework

Introduction

From the information provided in the in-depth interviews with one existing customer, Forrester has constructed a TEI framework for organizations considering upgrading to SQL Server 2008. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision. Most monetary values shown in this study are rounded to the nearest dollar for simplicity of presentation. Actual financial calculations might be based on figures carried to more decimal points than shown here.

Framework Assumptions

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

Table 2: General Assumptions

Ref.	General assumptions	Value
A1	Discount rate	10%
A2	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 finance to determine the most appropriate discount rate to use within their organizations.

In addition to the financial assumptions used to construct the cash flow analysis, Table 3 provides salary assumptions used for all cost and benefit calculations

Table 3: Salary Assumptions

Ref.	Metric	Calculation	Value
B1	Workdays per year (excluding weekends, holidays and vacation)		220
B2	Fully burdened annual salary* per database administrator (Year 1)	Increases 3% yearly	$95,000
B3	Fully burdened daily* per database administrator (Year 1)	=B2 / B1	$431.82
B4	Fully burdened annual salary* per higher grade IT employee (Year 1)	Increases 3% yearly	$80,000
B5	Fully burdened daily* per higher grade IT employee (Year 1)	=B4 / B1	$363.64
B6	Fully burdened annual salary* per "other" IT employee (Year 1)	Increases 3% yearly	$45,000
B7	Fully burdened daily* per "other" IT employee (Year 1)	=B6 / B1	$204.55
B8	Fully burdened annual salary* per business employee (Year 1)	Increases 3% yearly	$45,000
B9	Fully burdened daily* per business employee (Year 1)	=B8 / B1	$204.55

*Includes salary, variable compensation, and all direct benefits (e.g., health insurance)

Source: Forrester Research, Inc.

Several of the cost and benefit calculations are based on the number of SQL Server licenses and hardware required. Prior to the upgrade, this customer had already purchased enough SQL Server licenses to cover its needs under SQL Server 2008. Improved performance and the use of Resource Governor will allow the customer to consolidate onto fewer servers, resulting in the customer having extra licenses. The customer plans to continue to pay for Software Assurance on all existing licenses so they will be available for use in the future.

SQL Server licenses are priced on a per CPU basis. The new hardware servers that the customer is installing are two-CPU, quad-core boxes. Additionally, the customer has two standby servers that do not require licenses, and three servers are vendor specific and covered by separate licenses. The customer ran two instances of SQL Server 2005 per server.

Table 4 describes the current and future server installation along with the number of "Enterprise" and "Standard" SQL Server licenses. The customer would be interested in upgrading all licenses to Enterprise licenses, but has decided not to do so for cost reasons. The license costs described in this table can be used by a reader to calculate the total cost of additional licenses if needed.

Table 4: Server And License Volumes

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
C1	# of SQL Server 2005/2000 servers	=C1 [previous year] - C4	19	11	0	0
C2	# of SQL Server 2008 servers added (2 CPU)		1	8	7	0
C3	Total # of SQL Server 2008 servers (2 CPU)	=C3 [previous year] + C2	1	9	16	16
C4	SQL Server 2005/2000 servers repurposed (non SQL)/retired		0	8	11	0
C5	Total server estate	=C1 + C3	20	20	16	16
C6	Total # of SQL Server Enterprise licenses held		22	22	22	22
C7	SQL Server Enterprise license cost (per CPU)		$24,000	$24,000	$24,000	$24,000
C8	Total # of SQL Server Standard licenses held		10	10	10	10
C9	SQL Server Standard license cost (per CPU)		$6,000	$6,000	$6,000	$6,000

Source: Forrester Research, Inc.

Costs

This section describes the customer's overall costs to initially upgrade, further migrate databases, and operate SQL Server 2008. Some of these costs existed as part of this customer's SQL Server 2005 solution (e.g., a database support team) and continue to be incurred. They are included in this study to show the total cost of ownership (TCO).

Initial Implementation Labor Costs

The initial implementation consisted of assessing and planning the upgrade, setting up the initial SQL Server 2008 server and storage, and installing SQL Server 2008 and migrating the initial databases. Once the initial implementation was completed, the upgrade process became part of "business as usual" operations for the database administration (DBA) team, the costs of which are captured in ongoing operations.

This customer did all of this work in house without need of external consultants. The reader's organization might require professional services and should take these costs into consideration.

Implementation required a total of 20 days of effort by the DBA team (spread out amongst 3 individuals) and two days of effort each by the storage and server teams. The DBA per day cost is

$431.82, the per day cost of the storage and server team members $363.64. The resulting implementation labor cost is equal to 20 DBA days x $431.82 + 4 Server/Storage days x $363.64 for a total cost of $10,091 (rounded).

Table 5: Initial Internal Implementation Labor Costs, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial
D1	DBA team - days of effort		20
D2	Fully burdened daily cost - DBA	= B3	$431.82
D3	Storage and server teams - days of effort		4
D4	Fully burdened daily cost - other IT	= B5	$363.64
Dt	Initial implementation labor costs	=(D1 * D2) + (D3 * D4)	$10,091

Source: Forrester Research, Inc.

DBA Team Training

The DBAs received training from Microsoft on SQL Server 2008 features and how best to realize value from using the product. Each member of the DBA team received, on average, ten days of training in the form of presentations, demonstrations, and some formal training during the initial period. Non labor costs of training are included in the Software Assurance contract.

Table 6: DBA Team Training, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
E1	Number of employees		3	4	4	4
E2	Days per employee		10	5	10	10
E3	Fully burdened cost per day		$431.82	431.8	$444.77	$458.12
Et	DBA training	=E1 * E2 * E3	$12,955	$8,636	$17,791	$18,325

Source: Forrester Research, Inc.

Added Server Costs

This customer replaced its existing servers with new ones. This was completed as part of its regular hardware retirement schedule. The objective is to keep all servers under the basic three-year warranty period and get the best performance per dollar.

The new servers are all HP DL385 or DL585 units with two quad-core processors and 32GB of memory. The cost of the server includes a three-year hardware warranty. Each server also requires a fiber channel card in order to be connected to the EMC storage network. To simplify the model, an average cost per server was used.

Setting up the servers and LAN consumed of two hours of installation labor and required cabling and power hardware, additional rack space, and the addition of Cisco hardware to the network.

Table 7: Added Server Costs, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
F1	HP server cost		$7,000	$7,000	$7,000	$7,000
F2	HP fiber channel card cost		$2,000	$2,000	$2,000	$2,000
F3	Installation and LAN costs		$2,800	$2,800	$2,800	$2,800
F4	Number of servers added	=C2	1	8	7	0
Ft	Added server costs	=(F1 + F2 + F3) * F4	$11,800	$94,400	$82,600	$0

Source: Forrester Research, Inc.

SQL Server Software Assurance Costs

As discussed earlier, this customer purchased Software Assurance as part of its original SQL Server licenses, which enabled it to avoid upgrade license costs as well as realize other benefits. Software Assurance pricing is based on 25% of total license costs. This provides three years of coverage. To simplify the timing within the model, these costs were distributed equally over all years.

Table 8: SQL Server Software Assurance Costs, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
G1	# of Enterprise Sequel Server 2008 SA licenses	=C6		22	22	22
G2	# of Standard Sequel Server 2008 SA licenses	=C7		10	10	10
G3	Annual cost per Enterprise license	=(C7 * 25%) / 3 years		$2,000	$2,000	$2,000
G4	Annual cost per Standard license	=(C8 * 25%) / 3 years		$1,000	$1,000	$1,000
Gt	SQL Server Software Assurance cost	=(G1 * G3) + (G2 * G4)		$54,000	$54,000	$54,000

Source: Forrester Research, Inc.

Ongoing Operations

The DBA team, which obviously existed prior to the upgrade to SQL Server 2008, is responsible for ongoing maintenance, installations, and upgrades of SQL Server 2008. In Year 1, the team added a fourth member of who spends 50% time working on SQL Server and the remainder working on other database technologies. This, and all subsequent tables showing annual fully burdened cost, reflect a 3% increase per year.

Table 9: Ongoing Operations, Non-Risk-Adjusted

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3
H1	FTEs on DBA team		0	3.5	3.5	3.5
H2	Annual fully burdened cost	= B2	0	$95,000	$97,850	$100,786
Ht	Ongoing operations costs	=H1 * H2		$332,500	$342,475	$352,749

Source: Forrester Research, Inc.

Total Costs

Table 10 summarizes the costs associated with this customer's implementation and ongoing operation of SQL Server 2008.

Table 10: Total Costs Of SQL Server 2008 Upgrade, Non-Risk-Adjusted

Ref.	Costs	Initial	Year 1	Year 2	Year 3	Total	Present value
Dt	Initial implementation labor costs	$10,091				$10,091	**$10,091**
Et	DBA training	$12,955				$12,955	**$12,955**
Ft	Added server costs	$11,800	$94,400	$82,600		$188,800	**$165,883**
Gt	SQL Server Software Assurance cost		$54,000	$54,000	$54,000	$162,000	**$134,290**
Ht	Ongoing operations costs		$332,500	$342,475	$352,749	$1,027,724	**$850,336**
	Total	**$34,845**	**$480,900**	**$479,075**	**$406,749**	**$1,401,570**	**$1,173,554**

Source: Forrester Research, Inc.

Benefits

The first half of this section details the quantitative benefits included in the ROI analysis. The second half describes qualitative benefits this customer experienced but could not be quantified. The qualitative benefits are potentially as valuable as the quantitative ones, and should be taken into consideration when analyzing the total return on investment realized from upgrading to SQL Server 2008.

Avoided Additional SQL Server Licenses

Prior to upgrading to SQL Server 2008, this customer was adding, on average, four new hardware servers per year to accommodate growth. Because of the performance improvements in SQL Server 2008, it will no longer need to add hardware servers to handle planned growth. In the future, there might be new projects that will require additional hardware servers, but none are currently planned and would anyway be beyond the scope of this study.

Table 11: Avoided Additional SQL Server Licenses, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
J1	# of SQL Server 2005 Enterprise licenses not added	= 4 hardware servers per year * 2 CPUs	8	8	8
J2	Cost per SQL Server 2005 Enterprise license	= C7	$24,000	$24,000	$24,000
J3	Annual Software Assurance cost (per license)	= G3	$2,000	$2,000	$2,000
Jt	Avoided additional SQL Server licenses	=(J1 * J2) + (J1[sum through current year] * J3)	$208,000	$224,000	$240,000

Source: Forrester Research, Inc.

Avoided Additional Server Hardware

This customer has realized savings from deferring hardware server additions. Beyond the four hardware servers not added each year for SQL Server, the customer was able to repurpose five retired SQL Server 2005 hardware servers in Year 1 to its disaster recovery solution, resulting in additional savings.

Table 12: Avoided Additional Server Hardware, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
K1	Fewer # of SQL Server hardware servers purchased		4	4	4
K2	Fewer # of other servers purchased		5	0	0
K3	Cost per server	= F1 + F2 + F3	$11,800	$11,800	$11,800
Kt	Avoided additional server hardware	= (K1 + K2) * K3	$106,200	$47,200	$47,200

Source: Forrester Research, Inc.

Avoided Additional Storage

The data compression feature in SQL Server 2008 has significantly reduced the amount of storage required. On average, the customer is reducing storage space by 50%. It was able to free up one terabyte (TB) of storage space for the existing 200 SQL Server databases. Additionally, the amount of storage added in future years will be reduced from 500GB to 250GB per year. The result is that no storage needs to be added to support the SQL Server databases for the next three years.

There are also storage savings for the daily backups of the SQL Server databases. This has been reduced from 30GB per day down to 11. It is estimated that this will prevent the addition of 1TB of storage per year.

The customer uses EMC storage and estimates that its total cost of ownership (TCO) for storage, including hardware and allocated maintenance costs, to be at the low end of the industry average scale of $15 to $30 per gigabyte.

Table 13: Avoided Additional Storage, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
L1	SQL database storage not added (GB)		500	500	500
L2	Cost per GP of SQL database storage (TCO)		$15.00	$15.00	$15.00
L3	Backup site storage not added (GB)		1,000	1,000	1,000
L4	Cost per GB of backup storage not added (TCO)	= L2	$15.00	$15.00	$15.00
Lt	Avoided additional storage	=(M1 * M2) + (M3 * M4)	$22,500	$22,500	$22,500

Source: Forrester Research, Inc.

Third-Party Software Savings

Prior to upgrading to SQL Server 2008, the customer required the use of third-party software as part of its overall solution. This was mainly in the areas of backup, encryption, auditing, and performance monitoring. The customer was paying annual maintenance on existing third-party licenses plus additional licenses for every SQL Server server added. These costs have now been eliminated because the features being used are included in SQL Server 2008.

Table 14: Third-Party Software Savings, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
M1	Third-party SW license costs per new server		$15,000	$15,000	$15,000
M2	# of SQL Server servers not added	=K1	4	4	4
M3	Existing third-party SW maintenance costs			$50,000	$50,000
Mt	Third-party software savings	=(M1 * M2) + M3	$60,000	$110,000	$110,000

Source: Forrester Research, Inc.

Avoided Additional Hires

Because of the improved usability of SQL Server 2008, existing employees can be more productive. For certain types of employees, it was possible to forecast how many additional hires can be avoided over the next three years.

- SQL Server DBAs will not need to be added primarily because the Policy Management feature will make it much easier to set up, manage, and troubleshoot the 200+ databases. According to the database management team lead, "instead of having a DBA work on a single project, each can now work on two or three projects at a time."

- Because of the tight integration of Visual Studio with SQL Server 2008, a developer can work on several projects. This means additional Web developers will not be needed.

- The data backup and restore team will not have to add a resource because data compression reduces the effort required to manage tape backups.

Table 15: Avoided Additional Hires, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
N1	Total # of new DBAs not hired		0	3	3
N2	Annual fully burdened cost per DBA	= B2	$95,000	$97,850	$100,786
N3	Total # of new Web developers not hired		0	2	2
N4	Annual fully burdened cost per Web developer	= B4	$80,000	$82,400	$84,872
N5	Total # of new data backup FTEs not hired		0	1	1
N6	Annual fully burdened cost per data FTE	= B6	$45,000	$46,350	$47,741
Nt	Avoided additional hires	=(N1 * N2) + (N3 * N4) + (N5 * N6)	$0	$504,700	$519,841

Source: Forrester Research, Inc.

Increased User Productivity

In addition to the specific examples of new hires avoided that were discussed above, some other employee types will realize productivity gains:

- Application developers will be able to more quickly roll out and update applications because of the greater usability of SQL Server 2008.

- Approximately 500 business users run multiple SQL Server database queries every day. Currently, the total daily time for these queries can be more than 30 minutes per user and render their computers largely unusable because of computational power requirements. Improved performance and new features of SQL Server 2008 like Resource Governor have greatly reduced the time these queries take and enable users to continue with other work while waiting for results.

The total productivity benefit realized by the customer has been reduced by half to reflect the fact that not every minute gained translates into productive work. The reader can assume that this reduced benefit is achievable and will result in direct financial benefit.

Table 16: Increased User Productivity, Non-Risk-Adjusted

Ref.	Metric	Calculation	Year 1	Year 2	Year 3
O1	# of application developers		10	20	25
O2	Increased productivity		25%	25%	25%
O3	Annual fully burdened salary per application developer	= B4	$80,000	$82,400	$84,872
O4	# of power business users		75	300	500
O5	Hours saved per power user per year	=.5 hours per day * 220 days	110	110	110
O6	Hourly fully burdened salary per power user	= B8/8 hours	$25.57	$26.34	$27.13
O7	Total productivity savings	=(O1*O2*O3) + (O4*O5*O6)	$410,938	$1,281,063	$2,022,341
O8	Percent realized		50%	50%	50%
Ot	Increased user productivity	=O7 * O8	$205,469	$640,531	$1,011,170

Source: Forrester Research, Inc.

Total Quantified Benefits

Table 17 summarizes the total quantified benefits this customer realized by upgrading to SQL Sever 2008.

Table 17: Total Quantified Benefits Of SQL Server 2008, Non-Risk-Adjusted

Ref.	Benefits	Year 1	Year 2	Year 3	Total	Present value
Jt	Avoided additional SQL Server licenses	$208,000	$224,000	$240,000	$672,000	**$554,530**
Kt	Avoided additional server hardware	$106,200	$47,200	$47,200	$200,600	**$171,016**
Lt	Avoided additional storage	$22,500	$22,500	$22,500	$67,500	**$55,954**
Mt	Third-party software savings	$60,000	$110,000	$110,000	$280,000	**$228,099**
Nt	Avoided additional hires		$504,700	$519,841	$1,024,541	**$807,672**
Ot	Increased user productivity	$205,469	$640,531	$1,011,170	$1,857,170	**$1,475,862**
	Total	**$602,169**	**$1,548,931**	**$1,950,711**	**$4,101,811**	**$3,293,133**

Source: Forrester Research, Inc.

Qualitative Benefits

Better Database Performance And Enhanced Features

The customer decided to upgrade to SQL Server 2008 primarily to take advantage of enhanced features and improved performance as opposed to as a result of a specific cost benefit analysis. Of the many added features, the ones most often mentioned as key motivators were:

- Transparent data encryption.

- Data compression.

- Spatial data for creating "a more enriched, visual experience for easier doctor lookup."

- Policy management

- Auditing at the database access and data record level "to make for easier troubleshooting, HIPAA compliance, and much better management. It provides evidence and complete audit trails."

- Resource Governor (which enables more instances of SQL Server to be run on the same server and eliminates the risk of users running queries that affect performance for other users).

The customer also saw significant improvement in performance from the time of the initial upgrade, without any changes to the hardware or data schemas. In SQL Server 2005, the servers were running at 50%–60% of CPU capacity. With SQL Server 2008, this has decreased to 30%–40% running on identical hardware. This has allowed them to run three to four SQL Server instances on one hardware server instead of one or two. Despite the use of data compression and encryption, there has been no decrease in performance, in fact for many applications there was a 20 – 25% improvement in performance.

Improved Data Security

Data encryption and other security features in SQL server 2008 have improved overall data security. In 2005, the customer suffered an SQL Injection attack. It can now more easily defend against this and other attacks by employing common policies and ensuring that databases are properly secured.

As discussed earlier, auditing has significantly improved overall security and in meeting HIPAA compliance. The monitoring tools also enable the DBA team to spot potential problems before they arise. In addition, having all of the security requirements as part of a single product improves the efficiency and security of the databases.

Improved Working Experience For The DBA Team

Upgrading to SQL Server 2008 has improved the work experience for the DBA team. Because most patches and service packs can be deployed by taking a server down for only a couple of minutes (instead of 30 minutes) and the servers are clustered, the team can perform these activities during regular working hours instead of on nights and weekends. Also, because their time is no longer taken up trying to enforce policy and performing audits and other basic activities, the DBAs are able to work on more interesting projects.

Risk

Risk, the third component of the TEI model, is used as a filter to capture the uncertainty surrounding different cost and benefit estimates. If a risk-adjusted ROI still demonstrates a compelling business case, it raises confidence that the investment is likely to succeed because the risks that threaten the project have been taken into consideration and quantified. The risk-adjusted numbers should be taken as "realistic" expectations because they represent the expected values when risk is considered. In general, risks affect costs by raising, and benefits by reducing, the original estimates.

Each benefit and cost is assigned a "low," "medium," "high," or "none" risk rating. The following benefits and costs were rated as either low, medium, or high risk:

- **Initial implementation labor cost: medium risk.** A reader's organization might require more time on the initial implementation depending on the existing expertise in SQL Server and complexity of the environment.

- **DBA training cost: low risk.** There is a chance that an organization's DBAs will require more training than those of this customer.

- **Avoided additional SQL Server licenses benefit: medium risk.** If a reader's organization does not need to add servers on an ongoing basis, this benefit would not apply or would be reduced.

- **Avoided additional server hardware: medium risk.** For readers' organizations that do not need additional servers on an ongoing basis, this benefit would not apply or would be reduced.

- **Third-party software savings: medium risk.** For readers' organizations that do not use any of the third-party software that was replaced by new features in SQL Server 2008, this benefit would not apply.

- **Avoided additional hires: medium risk.** Depending on expected growth and overall size, a reader's organization might not realize as many future headcount savings.

- **Increased user productivity: low risk.** Although a reader's organization might be smaller and therefore not realize the same level of productivity benefits, the fact that this benefit has been reduced by 50% limits the risk.

For purposes of this analysis, Forrester risk-adjusts cost and benefit estimates to better reflect the level of uncertainty for each. The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of these points.

For example, the risk associated with initial implementation labor costs is defined as "medium." This risk level was chosen because other companies might have to spend more time working on the initial implementation or bring in consultants. The original estimated cost in the initial period is $10,091. To calculate the risk-adjusted cost, the "most likely" scenario is set at 100% of cost, the "high" scenario is assigned 125% of cost, and the "low" scenario is assigned 100% of cost. The rounded mean of these three values is 108%. The resulting cost used in the risk-adjusted table is $10,898, or 108% of $10,091.

The following tables show the values used to adjust for uncertainty in cost and benefit estimates. Readers are urged to apply their own risk ranges based on their degree of confidence in the cost and benefit estimates.

Table 18: Risk Adjustments To Costs

Ref.	Risk adjustments to costs	Risk scoring	Low	Most likely	High	Risk-adjusted
P1	Initial implementation labor costs	Medium	100%	100%	125%	108%
P2	DBA training costs	Low	100%	100%	110%	103%

Source: Forrester Research, Inc.

Table 19: Risk Adjustments To Benefits

Ref.	Risk adjustments to benefits	Risk scoring	Low	Most likely	High	Risk-adjusted
Q1	Avoided additional SQL Server licenses	Medium	70%	100%	100%	90%
Q2	Avoided additional server hardware	Medium	70%	100%	100%	90%
Q3	Third-party software savings	Medium	70%	100%	100%	90%
Q4	Avoided additional hires	Medium	70%	100%	100%	90%
Q5	Increased user productivity	Low	85%	100%	105%	97%

Source: Forrester Research, Inc.

Flexibility

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

The database management team lead said that "[they] turned on everything because [they] liked all the features and had been waiting for them to be available," there are a couple of flexibility options for future use of SQL Server 2008:

- It can easily deploy more instances of SQL Server to support more applications because of increased SQL Server performance.

- New projects and services built on SQL Server can be undertaken or launched for business users by increasing the number of servers and hiring additional DBAs.

Given that all of the features of SQL Server 2008 are included in the base price, a reader's organization can begin to use them at any time without incurring additional license costs, although some internal development or other costs might be associated with using these features.

For purposes of the ROI calculations, no flexibility benefits were included.

TEI Framework: Summary

Considering the financial framework constructed above, the results of the costs, benefits, and risk sections can be used to determine a return on investment, net present value, and payback period. Table 20 and Table 21, below, show the risk-adjusted cost and benefit values, applying the risk-adjustment method indicated in the Risk section and the values from Table 18 and Table 19 to the numbers in Table 10 and Table 17, respectively.

Table 20: Risk-Adjusted Costs

Ref.	Costs	Initial	Year 1	Year 2	Year 3	Total	Present value
R1	Initial implementation labor costs	$10,898				$10,898	**$10,898**
R2	DBA training	$13,343				$13,343	**$13,343**
R3	Added server costs	$11,800	$94,400	$82,600		$188,800	**$165,883**
R4	SQL Server Software Assurance cost		$54,000	$54,000	$54,000	$162,000	**$134,290**
R5	Ongoing operations costs		$332,500	$342,475	$352,749	$1,027,724	**$850,336**
	Total	**$36,041**	**$480,900**	**$479,075**	**$406,749**	**$1,402,766**	**$1,174,750**

Source: Forrester Research, Inc.

Table 21: Risk-Adjusted Benefits

Ref.	Benefits	Year 1	Year 2	Year 3	Total	Present value
S1	Avoided additional SQL Server licenses	$187,200	$201,600	$216,000	$604,800	**$499,077**
S2	Avoided additional server hardware	$95,580	$42,480	$42,480	$180,540	**$153,914**
S3	Avoided additional storage	$22,500	$22,500	$22,500	$67,500	**$55,954**
S4	Third-party software savings	$54,000	$99,000	$99,000	$252,000	**$205,289**
S5	Avoided additional hires		$454,230	$467,857	$922,087	**$726,905**
S6	Increased user productivity	$199,305	$621,315	$980,835	$1,801,455	**$1,431,586**
	Total	**$558,585**	**$1,441,125**	**$1,828,672**	**$3,828,382**	**$3,072,725**

Source: Forrester Research, Inc.

The values used throughout the TEI framework are based on in-depth interviews with one organization. Forrester makes no assumptions as to the potential return that other organizations will realize within their environments. Forrester strongly advises that readers use their own estimates within the framework provided in this study to determine the expected financial impact of upgrading to Microsoft SQL Server 2008.

Study Conclusions

Forrester's in-depth interviews with a healthcare system customer currently using SQL Server 2008, yielded several important observations.

The organization realized numerous benefits, some easily measured for this ROI study and others, equally as valuable, that could not be quantified. Specifically, the benefits realized include:

- avoided the addition of SQL Server 2008 servers (license and hardware savings) because of improved performance which enabled consolidation and more efficient use of the hardware servers;

- avoided the addition of storage capacity by achieving data compression rates of 50%;

- eliminated third-party software by using new features included in SQL Server 2008;

- avoided hiring additional IT employees because new features improved worker efficiency;

- increased user productivity (business and IT) through improved usability and SQL Server performance;

- improved database performance (CPU usage and applications speed) and access to enhanced features such as Policy Management and Resource Governor;

- improved data security, which made HIPAA compliance more efficient; and

- improved the work experience for the database administration team by greatly reducing the need to work on weekends and by freeing up time to work on more interesting projects.

By upgrading to SQL Server 2008, this customer was able to improve overall performance and take advantage of many new features. Because it had Software Assurance, it was able to achieve this at relatively low cost. Overall, it was a very simple process to upgrade, and benefits were realized quickly.

The financial analysis provided in this study illustrates one potential way an organization can evaluate the value proposition of upgrading from a previous version of SQL Server to SQL Server 2008. Based on information collected from in-depth interviews with one existing healthcare customer, Forrester calculated a three-year, risk-adjusted ROI of 162% with a payback period of six months after implementation. All final estimates are risk-adjusted to incorporate potential uncertainty in the calculation of costs and benefits.

Table 22: ROI, Original And Risk-Adjusted

Summary financial results	Unadjusted (best case)	Risk-adjusted
ROI — three-year	181%	162%
Payback (months)	Four	Six
Total three-year costs (PV)	$1,173,554	$1,174,750
Total three-year benefits (PV)	$3,293,133	$3,072,725
Total three-year net savings (NPV)	$2,119,579	$1,897,976
Internal rate of return (IRR)	701%	587%

Source: Forrester Research, Inc.

Figure 1: Summary Financial Results, Risk-Adjusted
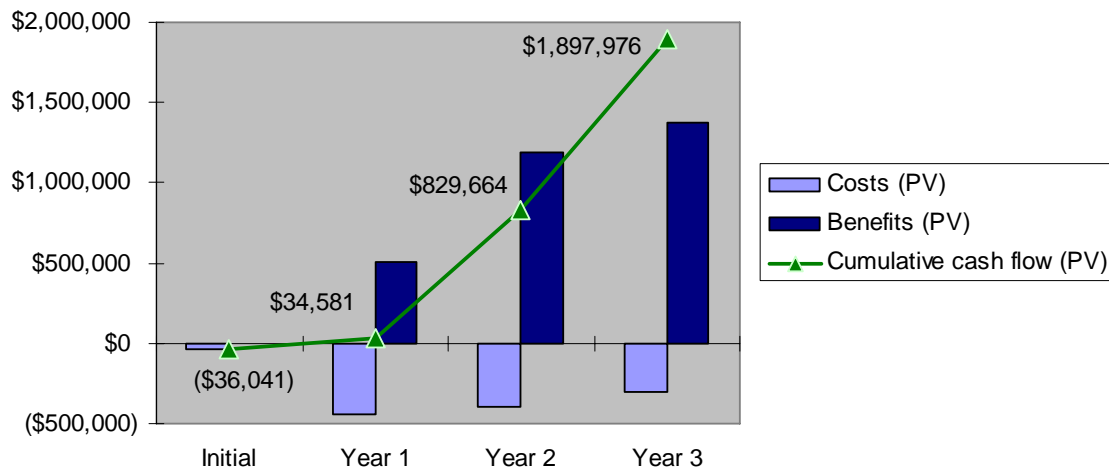
Source: Forrester Research, Inc.

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 and justify to senior management and other key business stakeholders as well as realize the tangible value of IT initiatives.

The TEI methodology consists of four components for evaluating investment value: benefits, costs, risks, and flexibility. For purposes 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. 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 might incur costs in the form of fully burdened labor, subcontractors, or materials. Costs consider all the investments and expenses necessary to deliver the proposed value. In addition, the cost category within TEI captures any incremental costs over the existing environment for ongoing costs associated with the solution. All costs must be tied to the benefits that are created.

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 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. Although direct benefits are typically 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 might translate into greater worker productivity if activated. The collaboration can only be used with an additional investment in training at some

future 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 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 payback period is the breakeven point for an investment, the point at which net benefits (benefits minus costs) equal initial investment or cost.

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

A Note On Cash Flow Tables

The following is a note on the cash flow tables used in this study (see the Example Table below). The initial investment column contains costs incurred at "time 0" or at the beginning of Year 1. Those costs are not discounted. All other cash flows in Years 1 through 3 are discounted using the discount rate shown in [Table 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.