The Total Economic Impact Of Oracle Real Application Testing

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Forrester Consulting
Making Leaders Successful Every Day

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About Forrester Consulting

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Executive Summary

In early 2012, Forrester Consulting initiated work on a research project focused on examining the potential return on investment (ROI) that enterprises may realize by adopting Oracle Real Application Testing, an Oracle Database Enterprise Edition option. This study specifically focuses on the benefits of reliably managing change and performance in enterprisewide systems using Oracle Real Application Testing.

The benefits and costs of deploying Oracle Real Application Testing are highlighted across the enterprise of a composite organization called Ace International, a multinational conglomerate (See Appendix A for a detailed description of the composite organization). The findings in this study are based on in-depth interviews conducted with four organizations currently utilizing Oracle Real Application Testing on a regular basis. Readers should note that, although the benefits of Oracle Real Application Testing can apply to an organization of any size, this study examines the estimated ROI for the composite organization and presents aggregate findings derived from the interviews, analysis, and Forrester's independent research.

Oracle Real Application Testing Improves Productivity And Database Availability

Our interviews with four existing customers and a subsequent financial analysis found that the composite organization achieved a very favorable 224% risk-adjusted ROI over a three-year time frame, with a payback period of 5.9 months and a total benefit of $5,936,022, as shown in Table 1.[1]

Table 1

Composite Organization Three-Year Risk-Adjusted Sales Growth/ROI/TCO

ROI	Payback period	Total benefits (PV)	Total costs (PV)	Net present value (NPV)
224%	5.9 months	$5,936,022	($1,832,169)	$4,103,853

Source: Forrester Research, Inc.

- **Benefits.** Ace International, the composite organization, experienced several substantial benefits from implementing Oracle Real Application Testing. The following are the most significant benefits realized by Ace International. Forrester believes that organizations considering implementing Oracle Real Application Testing can also expect to experience these same benefits.

  - **Increased productivity.** Forrester found that organizations using Oracle Real Application Testing can expect a significant increase in the productivity of database administrators (DBAs) tasked with database testing activities during planned and unplanned maintenance and infrastructure upgrade periods. Organizations can expect these productivity gains to amount to nearly $4 million over three years.

- o **Enhanced business application uptime.** Users of Oracle Real Application Testing can also expect increased availability and uptime of critical business applications as a result of an improved ability to identify and resolve problems before a system enters production. Ace International, with a large number of mission-critical revenue-generating applications, was able to increase revenues by at least $51,366 over three years. Readers of this study should note that some customers may experience even greater benefits due to a higher level of criticality assigned to specific business applications than assumed in this study.

- o **Reduced capital expenditures.** Forrester also found that organizations can benefit from the resource efficiency gains resulting from the use of Oracle Real Application Testing. The resource efficiency gains are a result of the ongoing optimization and regression remediation of suboptimal SQL and a significant reduction in the time and resources needed to adopt new technology, resulting in faster time-to-value. For Ace International, this amounted to a 50% reduction in the number of enterprise-grade servers needed over the three-year period — a benefit that was worth $1,915,312.

These benefits are, in part, a result of overcoming the following historical challenges the composite organization was facing:

- o Productivity losses due to 1) inefficient use of administrator resources when executing planned and unplanned system management events and 2) manual, incomplete, ad hoc testing of changes.

- o Business productivity losses due to 1) significant time spent resolving production downtime and 2) identifying and resolving preventable production issues in preproduction.

- o Capital expenditure rises due to inefficient resource utilization by poorly performing systems and 2) lack of accurate performance testing resulting in overallocation of system resources.

Figure 1

Three-Year Risk-Adjusted Benefits
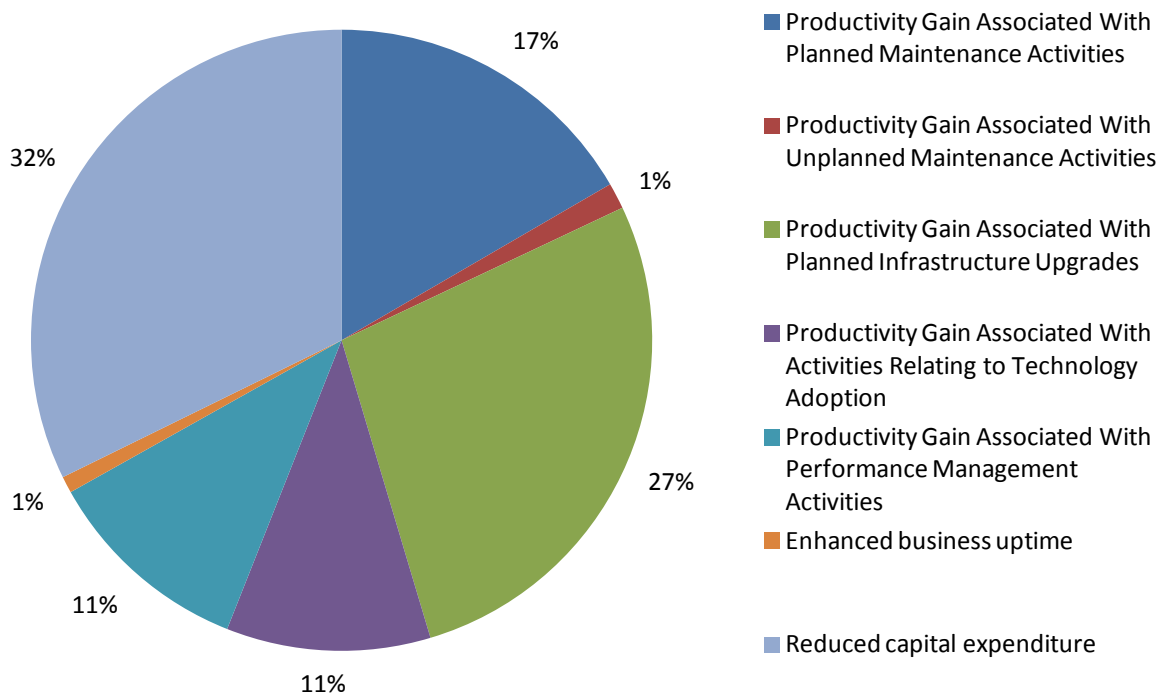
Source: Forrester Research, Inc.

- **Costs.** Forrester learned that the key cost components of Oracle Real Application Testing for ACE International are the license fees and professional services. The total present value of risk-adjusted costs for the three-year period of analysis amounts to $1,832,169, with the license fees making up an overwhelming majority of the total three-year costs.

Factors Affecting Benefits And Costs

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

- **The number of applications and databases.** An organization that has significantly more business applications or production databases than the assumptions made for the composite organization profiled in this study may see increased license fees but considerably greater potential benefits around productivity increases, business uptime, and capital savings.

- **The time and effort spent on testing and quality assurance.** Productivity increases resulting from the use of Oracle Real Application Testing are based on the frequency and duration of testing and quality assurance activities associated with IT maintenance and upgrades. Organizations that spend more time and effort on testing than the assumptions made for the composite organization are likely to experience far greater productivity gains than the conservative estimates cited in this study.

Disclosures

The reader should be aware of the following:

- The study is commissioned by Oracle and delivered by the Forrester Consulting group.

- Forrester makes no assumptions as to the potential return on investment that other organizations will receive. Forrester strongly advises that readers should use their own estimates within the framework provided in the report to determine the appropriateness of an investment in Oracle Real Application Testing.

- Oracle reviewed and provided feedback to Forrester, but Forrester maintains editorial control over the study and its findings and does not accept changes to the study that contradict Forrester's findings or obscure the meaning of the study.

- The customer names for the interviews were provided by Oracle.

TEI Framework And Methodology

Introduction

From the information provided in the interviews, Forrester has constructed a Total Economic Impact™ framework for those organizations considering implementing Oracle Real Application Testing. The objective of the framework is to identify the cost, benefit, flexibility, and risk factors that affect the investment decision.

Purpose

The purpose of this study is to provide readers with a framework to evaluate the potential financial impact of Oracle Real Application Testing for their business. This study should be seen as a guide to better understand and evaluate Oracle Real Application Testing. Readers of this study who wish to calculate the expected return on investment their organizations may experience as a result of implementing Oracle Real Application Testing are encouraged to use the cost and benefit calculations and assumptions cited in this study.

Approach And Methodology

Forrester took a multistep approach to evaluate the impact that Oracle Real Application Testing can have on an organization (see Figure 2). Specifically, we:

- Interviewed Oracle marketing and product management employees to fully understand the value proposition of Oracle Real Application Testing.

- Interviewed four Oracle customers currently using Oracle Real Application Testing to obtain data with respect to costs, benefits, and risks.

- Analyzed findings from customer interviews and normalized these against Forrester's own expertise in enterprise IT quality management technologies.

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

- Constructed a financial model representative of the data collected in the interviews.

Figure 2

TEI Approach

Perform due diligence → Conduct customer interviews → Design composite organization → Construct financial model using TEI framework → Write case study

Source: Forrester Research, Inc.

Forrester employed four fundamental elements of TEI (see Appendix B) in this study:

1. Cost and cost reduction

2. Benefits to and savings for the entire organization

3. Risk

4. Flexibility

Given the increasing sophistication that enterprises have regarding ROI analyses related to IT investments, Forrester's TEI methodology serves the purpose of providing a complete picture of the total economic impact of purchase decisions. Please see Appendix B for additional information on the TEI methodology.

Analysis

Interview Highlights

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

1. A global hotel company based in the US, with more than 1,000 properties in approximately 100 countries, making it one of the world's largest hospitality companies. The 145,000-person company operates luxury and upscale full-service hotels, resorts, retreats, and residences and also engages in the development, ownership, and operation of vacation ownership resorts throughout the world.

2. An American property and casualty insurance company employing approximately 35,000 people. The company is primarily known for selling a variety of private auto homeowner and business insurance products through agencies as well as life, health, and retirement insurance to individual and institutional customers. The company also provides various banking products and services through multiple intermediary distribution channels.

3. A multinational provider of digital television entertainment in the United States, the Caribbean, and Latin America with more than 20,000 employees. The company provides direct broadcast satellite digital television services with approximately 160 national high-definition television channels and four 3D channels to more than 25 million subscribers.

4. A publicly traded financial credit services company that provides various financial products and services throughout North America and Europe. Employing nearly 30,000 people, the US-based company offers a variety of savings checking and loan products, credit and debit card products, and mortgage banking and treasury management services to more than 40 million consumers, small businesses, and commercial clients through 1,000 branches, the Internet, and other distribution channels.

The four interviews uncovered several important insights:

- All of the customers cited the need for significant reduction in change-induced database errors and improvement in the performance of mission-critical and revenue-generating production systems as one of the most important catalysts driving the purchase of Oracle Real Application Testing. Many of the customers Forrester spoke with described the corporate mandate to reduce the duration and frequency of system downtime, which can occur unexpectedly following routine system changes and edits in spite of rigorous functional testing.

- All of the interviewed customers expressed a strong need to improve the productivity and significantly reduce the workload of database administrators involved in testing and debugging following database upgrades, updates, and changes. In all of the companies that Forrester interviewed, the testing team consisted of a small group of highly qualified testers, developers, and DBAs that acted as a shared resource for all activities related to IT quality assurance. With constant pressures shortening development and testing time in spite of ever-increasing numbers of testing scenarios, individuals in these teams described the need to forgo comprehensive testing activities due to lack of resources and/or time and the need to create artificial workloads by prioritizing only the most important testing regimes. The testing coverage provided by these simulated workloads is often, at best, only 5% to 10% of

the workflows. As a result, despite heroic efforts by the staff, many issues can go undetected until production deployment, negatively affecting system performance and stability.

- Forrester also learned that, unsurprisingly, many of the IT organizations had nearly no desire or budget to make the sizable hardware or software investments required to comprehensively and efficiently test the impact of system changes to production systems in an automated fashion. Many of the interviewees lamented the need to rely on inadequate existing tools to test only subsets of real production workloads.

Composite Organization

Based on the interviews with the four existing customers provided by Oracle, Forrester constructed a TEI framework, a composite company, and an associated ROI analysis for organizations considering a purchase of Oracle Real Application Testing. Ace International, the composite organization that Forrester synthesized from the results, represents a multinational conglomerate interested in a solution that will help it efficiently test and debug 160 databases that power its 85 mission-critical business applications before it goes live into production. (See Appendix A for a detailed description of the composite organization.)

Framework Assumptions

Table 2 provides the model assumptions that Forrester used in this analysis. In addition to the financial assumptions used to construct the cash flow analysis, this table also provides a number of database instances, growth rates, and headcount and salary assumptions used within this analysis that pertain to the composite organization profiled in this study.

Table 2
Model Assumptions

Ref.	Metric	Calculation	Value
A1	Hours per week		40
A2	Weeks per year		52
A3	Hours per year (M-F, 9-5.)		2,080
A4	Hours per year (24x7)		8,736
A5	Midlevel database administrator (DBA)		$130,000
A6	Hourly rate	(A5/A3)	$62.50
A7	Number of database instances		160
A8	Annual growth of database instances		20%
A9	Number of business applications		85

Source: Forrester Research, Inc.

The discount rate used in the PV and NPV calculations is 10% and the time horizon used for the financial modeling is three years. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult with their respective company's finance department to determine the most appropriate discount rate to use within their own organizations.

Costs

Oracle Real Application Testing is a licensed option of Oracle Database 11g Enterprise Edition. The key cost categories associated with Oracle Real Application Testing are the license fees associated with the number of Oracle databases licensed, plus the implementation and training costs. The following are the costs Ace International would expect for implementing Oracle Real Application Testing over a three-year time frame.

License Fees

Oracle Real Application Testing requires the purchase of licenses based on the total number of CPUs in the production and testing database environments. Each license of Oracle Real Application Testing includes Database Replay and SQL Performance Analyzer (SPA).

Ace International has 160 production environment databases, each running on two dual-core processors. Assuming that only 40% of the total number of cores will require licenses of Oracle Real Application Testing and taking into account a processor core factor of 50% and the license discounts typically offered by Oracle, for this analysis Forrester

estimates an initial license fee of $1.1 million and a 22% maintenance fee, totaling $1,898 per database instance per year.[2]

Table 3
Annual License Fees

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
B1	Total production environment database instances		160	160	192	230	
B2	Average number of processors/cores per DB server		4	4	4	4	
B3	Percentage of testing instances needed based on production		40%	40%	40%	40%	
B4	Total number of processors licensed	B1*B2*B3	256	256	307	369	
B5	Processor core factor (assuming SUN SPARC 64)		50%	50%	50%	50%	
B6	Discounted license fee per processor core		$8,625	$1,898	$1,898	$1,898	
Bt	Annual fees	B4*B5*B6	$1,104,000	$242,880	$291,456	$349,747	
Bto	Total (original)		($1,104,000)	($242,880)	($291,456)	($349,747)	($1,988,083)

Source: Forrester Research, Inc.

Implementation And Training

While Oracle Real Application Testing can be configured and implemented relatively quickly through self-help guides and tutorials, the customers that experienced the greatest benefit from Oracle Real Application Testing stressed the need for careful implementation planning and comprehensive solution training. As such, Forrester recommends that the three DBAs at Ace International each attend a three-day hands-on training class and each dedicate at least a full working day to setting up and implementing Oracle Real Application Testing. The cost of doing so, assuming a fully-loaded hourly salary of $62.50, is $3,450.

Table 4
Implementation And Training Costs

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
C1	Number of DBAs		3				
C2	Cost per three-day training class day per DBA		$650				
C3	Number of hours required by each DBA to set up the environment		8				
C4	Fully-loaded hourly salary per FTE		$62.50				
Ct	Implementation and training	C1*C2+ (C1*C3*C4)	$3,450				
	Spread		100%	0%	0%	0%	
Cto	Total (original)		($3,450)	$0	$0	$0	($3,450)

Source: Forrester Research, Inc.

Total Costs

Table 5 summarizes the costs Ace International would realize when implementing Oracle Real Application Testing over a three-year time frame.

Table 5
Total Costs

Ref.	Cost category	Initial	Year 1	Year 2	Year 3	Total	PV
Bto	Annual fees	($1,104,000)	($242,880)	($291,456)	($349,747)	($1,988,083)	($1,828,443)
Cto	Implementation and training	($3,450)	$0	$0	$0	($3,450)	($3,450)
	Total costs (original)	($1,107,450)	($242,880)	($291,456)	($349,747)	($1,991,533)	($1,831,893)

Source: Forrester Research, Inc.

Benefits

The customers Forrester interviewed for this study collectively described a range of benefits that have positively affected their operations as a result of using Oracle Real Application Testing. The most significant of these quantified by customers relate to the significant increase in productivity for those involved in testing.

Additionally, interviewees reported that the ever-evolving and -increasing rate of growth of data (at times over 20%) is a key contributor to many of the day-to-day challenges and pains database administrators are facing. According to a recent International Oracle User Group (IOUG) survey on database manageability, purposefully delaying changes may alleviate some of the pain, but it comes with a significant disadvantage that most organizations cannot live with: an inability to access information or address the enterprise's evolving business requirements.[3] Oracle Real Application Testing's ability to automate the testing process with reliability has addressed businesses' surging requirements. Changes are now quickly deployed, performance issues addressed, and new technologies adopted with confidence to meet the ever-growing demand.

Customers reported time savings from the ability to more intelligently and more efficiently perform real-world testing. By capturing actual database workloads on production systems and replaying them on test systems with production characteristics such as timing and concurrency, DBAs were able to more quickly and easily perform load testing, determine potential problems, and come up with remedial solutions. As a result, customers remarked how their testing teams were able to, in the words of one interviewee, "double productivity" while at the same time meeting critical corporate demands of significantly improving their ability to test and diagnose errors before they are introduced into their production systems.

For each of the customers interviewed, the possibility of doing this would have been nearly impossible without Oracle Real Application Testing; relying on the manual effort of writing or editing thousands of test scripts and automating real-world workloads on a regular basis would have required adding "hundreds of man-hours" to their annual testing efforts and allocating an equally significant amount of hardware that the organization didn't have the budget to buy. Therefore, Oracle Real Application Testing was considered a critical testing capability for the customers Forrester interviewed.

Productivity Gain

In speaking with the customers, Forrester identified five different areas in which Ace International is likely to experience productivity gains: 1) planned maintenance activities, 2) unplanned maintenance activities, 3) planned infrastructure upgrades, 4) activities relating to technology adoption, and 5) performance management activities.

Planned Maintenance Activities

Interviewees reported that database administrators using Oracle Real Application Testing were able to shave off more than 90% of the time spent nearly every quarter on regular planned database maintenance activities such as testing and applying the latest security, CPU, PSU, operating system, hardware, and storage patches. With Oracle Real Application Testing, the DBAs that Forrester interviewed said they spent on average just 12 minutes on testing, which involved reviewing reports, identifying regressions, and taking remedial actions. At Ace International, this translates into saving DBAs more than a day's worth of work each quarter for each of the 160 database instances. Assuming fully-loaded salary rates for a DBA, Forrester estimates an annual savings of in excess of $352,000 each year.

Table 6

Productivity Gain Associated With Planned Maintenance Activities

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
D1	Number of DB instances		160	160	192	230	
D2	Task frequency per year		4	4	4	4	
D3	Time to complete each task without Oracle RAT (minutes)	3*180	540	540	540	540	
D4	Time to complete each task with Oracle RAT (minutes)		12	12.0	12.0	12.0	
D5	Fully-loaded hourly salary per FTE		$62.50	$62.50	$62.50	$62.50	
Dt	Productivity gain associated with planned maintenance activities	([D3-D4]/60)* D2*D1*D5	$352,000	$352,000	$422,400	$506,880	
Dto	Total (original)			$352,000	$422,400	$506,880	$1,281,280

Source: Forrester Research, Inc.

Unplanned Maintenance Activities

Forrester's research also indicated that DBAs can substantially reduce the amount of unscheduled time spent on testing and applying patches associated with security, CPU, PSU, operating system, hardware, and storage tiers outside the regular maintenance schedule. Oracle Real Application Testing customers reported saving an hour and a half for each database in response to application downtime or performance degradation occurring every two to eight months. For Ace International, this equates to savings of $90,000 per year or more, considering its 160 databases and a fully-loaded salary rate of $62.50 for a midlevel DBA.

Table 7

Productivity Gain Associated With Unplanned Maintenance Activities

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
E1	Number of DB instances		160	160	192	230	
E2	Task frequency per year		6	6	6	6	
E3	Time to complete each task without Oracle RAT (min)		100	100	100	100	
E4	Time to complete each task with Oracle RAT (min)		10	10	10	10	
E5	Fully-loaded hourly salary per FTE		$62.50	$62.50	$62.50	$62.50	
Et	Productivity gain associated with unplanned maintenance activities	([E3-E4]/60)* E2*E1*E5	$90,000	$90,000	$108,000	$129,600	
Eto	Total (original)			$90,000	$108,000	$129,600	$327,600

Source: Forrester Research, Inc.

Planned Infrastructure Upgrades

Another area of productivity gain is during planned infrastructure upgrades. Oracle Real Application Testing customers that Forrester spoke with indicated the ability to easily and quickly upgrade their infrastructure by reducing the time and effort involved in testing and ensuring the robustness and quality of applications. Customers reported saving almost all of the two days of testing and half-day of analysis that their testing team would otherwise spend on each database instance during annual planned infrastructure upgrades for the database, operating system, and associated hardware. Forrester believes that Ace International would save more than $580,000 per year in equivalent time spent on planned maintenance activities for all of their 160 database instances during infrastructure upgrades.

Table 8

Productivity Gain Associated With Planned Infrastructure Upgrades

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
F1	Number of DB instances		160	160	192	230	
F2	Task frequency per year		3	3	3	3	
F3	Time to complete each task without Oracle RAT (minutes)		1,200	1,200	1,200	1,200	
F4	Time to complete each task with Oracle RAT (minutes)		40	40	40	40	
F5	Fully-loaded hourly salary per FTE		$62.50	$62.50	$62.50	$62.50	
Ft	Productivity gain associated with planned infrastructure upgrades	([F3-F4]/60)* F2*F1*F5	$580,000	$580,000	$696,000	$835,200	
Fto	Total (original)			$580,000	$696,000	$835,200	$2,111,200

Source: Forrester Research, Inc.

Activities Relating To Technology Adoption

Interviewees also mentioned saving time when using Oracle Real Application Testing during upgrades to a newer version of Oracle Database or migrations to Oracle Exadata and adopting new functionality associated with database upgrades or migration to Oracle Exadata, such as advanced compression, Oracle Real Application Clusters (RAC), Partitioning, Auto DOP (Degree of Parallelism), Resource Manager, IORM (I/O Resource Manager), Automatic Memory Management, Flash Cache, and Transparent Data/Tablespace Encryption. The average time savings were nearly 2 days of testing and 1 day of analyzing the impact of new functionality for each of their organizations' databases. For Ace International, Forrester approximates the annual savings in terms of productivity gains to be over $235,000.

Table 9

Productivity Gain Associated With Activities Relating To Technology Adoption

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
G1	Number of DB instances		160	160	192	230	
G2	Task frequency per year		1	1	1	1	
G3	Time to complete each task without Oracle RAT (min)	60*8*3	1,440	1,440	1,440	1,440	
G4	Time to complete each task with Oracle RAT (min)		30	30	30	30	
G5	Fully-loaded hourly salary per FTE		$62.50	$62.50	$62.50	$62.50	
Gt	Productivity gain associated with activities relating to technology adoption	([G3-G4]/60)* G2*G1*G5	$235,000	$235,000	$282,000	$338,400	
Gto	Total (original)			$235,000	$282,000	$338,400	$855,400

Source: Forrester Research, Inc.

Performance Management Activities

Forrester's research also suggests that Ace International could save appreciable time spent on regular database performance management activities. Customers that Forrester spoke with described saving close to 2 hours nearly every month tuning the performance of each of their databases, including activities such as reactive manual root-cause analysis, proactively validating optimizer statistics gathering, and application performance drift (SQL workload snapshot comparison). For Ace International, this would translate into an annual savings of more than $230,000 in productivity gain attributable to Oracle Real Application Testing's SQL Performance Analyzer, assuming a fully-loaded annual salary rate for its DBAs.

Table 10

Productivity Gain Associated With Performance Management Activities

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
H1	Number of DB instances		160	160	192	230	
H2	Task frequency per year		12	12	12	12	
H3	Time to complete each task without Oracle RAT (min)		120	120	120	120	
H4	Time to complete each task with Oracle RAT (min)		5	5	5	5	
H5	Fully-loaded hourly salary per FTE		$62.50	$62.50	$62.50	$62.50	
Ht	Productivity gain associated with performance management activities	([H3-H4]/60)*H2*H1*H5	$230,000	$230,000	$276,000	$331,200	
Hto	Total (original)			$230,000	$276,000	$331,200	$837,200

Source: Forrester Research, Inc.

Enhanced Business Uptime

In addition to time savings, Oracle Real Application Testing customers also described a dramatic improvement in uptime for mission-critical applications. Prior to Oracle Real Application Testing, the senior leadership teams of the interviewees often complained about performance-related problems detected on productions systems that sometimes resulted in service-level agreement violations, unplanned downtime, and loss of revenue — despite the extensive time and efforts spent on testing beforehand.

To quantify this benefit for the purposes of this study, Forrester applied a $3 per-minute cost of downtime to 90 minutes of downtime avoided for each of Ace International's 85 business applications. Forrester recognizes that this may be overly conservative for many applications, such as sales tracking tools, CRM systems, or financial trading solutions. Using this figure, Forrester conservatively estimates that Ace International will benefit from increased application uptime resulting from the ability to safely introduce changes to production systems to the tune of nearly $23,000 per year. However, Forrester believes that the real value most customers will attribute to this benefit will be several orders of magnitude greater.

Table 11

Enhanced Business Uptime

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
I1	Number of business applications		85	85	85	85	
I2	Average annual cost of downtime		$1,000,000	$1,000,000	$1,000,000	$1,000,000	
I3	Average cost of downtime per minute		$3.00	$3.00	$3.00	$3.00	
I4	Minutes of downtime avoided		90	90	90	90	
It	Enhanced business uptime	I4*I1*I3	$22,950	$22,950	$22,950	$22,950	
Ito	Total (original)			$22,950	$22,950	$22,950	$68,850

Source: Forrester Research, Inc.

Reduced Capital Expenditure

Forrester also learned that customers using Oracle Real Application Testing needed fewer hardware resources to test their database instances than those without. Oracle Real Application Testing users mentioned the ability to run double the number of database instances on each server as a result of decreased system utilization from decommissioned application and middleware and increased efficiencies from proactive tuning and regression remediation. For Ace International, this means that 16 fewer servers, costing approximately $500,000 each, were needed as a result of using Oracle Real Application Testing. Even if only 30% of the savings in hardware can directly be attributable to Oracle Real Application Testing, the financial savings from not having to buy new hardware amounts to $2.4 million over three years.

Table 12

Reduced Capital Expenditures

Ref.	Metric	Calculation	Initial	Year 1	Year 2	Year 3	Total
J1	Number of DB instances		160	160	192	230	
J2	Number of DB instances on each server without Real Application Testing		5	5	5	5	
J3	Number of DB instances on each server with Real Application Testing		10	10	10	10	
J4	Reduction in the number of servers needed	(J1/J2)-(J1/J3)	16	16	16	16	
J5	Average annual acquisition costs of new server hardware and software		$500,000	$500,000	500,000	500,000	
J6	Percentage of cost savings associated with Real Application Testing		30%	30%	30%	30%	
Jt	Reduced capital expenditures	J5*J6*J4	$2,400,000	$2,400,000	$2,400,000	$2,400,000	
Jto	Total (original)			$1,200,000	$600,000	$600,000	$2,400,000

Source: Forrester Research, Inc.

Nonquantified Benefits

In addition to the benefits described above, some customers that Forrester interviewed also reported other ancillary benefits. Because of the difficulty in measuring these metrics and level of accuracy in estimating the financial value of these benefits, Forrester decided not to quantify these benefits and to leave it to the reader to include in the final results if he or she so wishes.

Improved Regulatory Compliance

Some customers reported an improved ability to comply with governmental and industry regulations as a result of being able to regularly making system changes such as hardware/software upgrades and patch applications.

Total Benefits

Table 13 summarizes the benefits Ace International would realize when implementing Oracle Real Application Testing over a three-year time frame.

Table 13
Total Benefits

Ref.	Benefit category	Initial	Year 1	Year 2	Year 3	Total	PV
Dto	Productivity gain associated with planned maintenance activities		$352,000	$422,400	$506,880	$1,281,280	$1,049,917
Eto	Productivity gain associated with unplanned maintenance activities		$90,000	$108,000	$129,600	$327,600	$268,445
Fto	Productivity gain associated with planned infrastructure upgrades		$580,000	$696,000	$835,200	$2,111,200	$1,729,977
Gto	Productivity gain associated with activities relating to technology adoption		$235,000	$282,000	$338,400	$855,400	$700,939
Hto	Productivity gain associated with performance management activities		$230,000	$276,000	$331,200	$837,200	$686,026
Ito	Enhanced business uptime		$22,950	$22,950	$22,950	$68,850	$57,073
Jto	Reduced capital expenditures		$1,200,000	$600,000	$600,000	$2,400,000	$2,037,566
	Total benefits (original)		$2,709,950	$2,407,350	$2,764,230	$7,881,530	$6,529,943

Source: Forrester Research, Inc.

Flexibility

Flexibility, as defined by TEI, is an investment in additional capacity or agility that could be turned into future business benefits at some additional cost. This provides an organization with the "right" or the ability to engage in future initiatives — but not the obligation to do so.

While the customers Forrester interviewed were unable to provide the data necessary for calculating the monetary value of the flexibility options, Forrester does recognize the additional flexibility that an organization gains by switching to a more automated and less laborious and time-consuming testing solution.

Since the potential benefits significantly improve the quality and scalability of the production systems and core business applications, Forrester believes that the range of flexibility options available to an organization is only limited by what it can do with a more efficient IT workforce, increased profits from greater application availability, and improved competitive advantage with the ability to implement new technologies quickly.

Risk

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

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

- Initial implementation costs can be higher in organizations with a greater number of databases or applications. However, there should be a corresponding increase in the benefits realized.

- The increased use of professional services for organizations with more complex IT environments can also increase these costs.

- Training costs can vary depending on the technical skill level of the database administrators and their ability to adopt new technologies such as Oracle Real Application Testing.

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

- Total productivity savings are a direct function of the number of DBAs and the duration and frequency of the various database testing activities described earlier they are involved in. This can result in lower total benefits for companies with smaller system or application footprints than the composite organization, but it can also mean substantially higher ROIs for those with larger footprints.

- The degree of application criticality and the frequency and duration of application downtime directly correspond to the financial impact Oracle Real Application Testing will have. Organizations without Oracle Real Application Testing that haven't experienced disruptions to their business as a result of prolonged frequent application outages are likely to benefit less than those organizations whose main revenue-generating activities rely on the continuous availability of those applications.

The TEI model uses a triangular distribution method to calculate risk-adjusted values. To construct the distribution, it is necessary to first estimate the low, most likely, and high values that could occur within the current environment. The risk-adjusted value is the mean of the distribution of those points. Table 14 and Table 15 shows the values used to adjust for risk and uncertainty in the cost and benefit estimates.

Table 14

Cost Risk Adjustments

Ref.	Category	Risk adjustment
X1	Annual fees	100%
X2	Implementation and training	108%

Source: Forrester Research, Inc.

Table 15

Benefits Risk Adjustments

Ref.	Category	Risk adjustment
Y1	Productivity gain associated with planned maintenance activities	94%
Y2	Productivity gain associated with unplanned maintenance activities	30%
Y3	Productivity gain associated with planned infrastructure upgrades	94%
Y4	Productivity gain associated with activities relating to technology adoption	90%
Y5	Productivity gain associated with performance management activities	94%
Y6	Enhanced business uptime	90%
Y7	Reduced capital expenditures	94%

Source: Forrester Research, Inc.

Readers are urged to apply their own risk ranges based on their own degree of confidence in the cost and benefit estimates.

Financial Summary

The financial results calculated in the Costs and Benefits sections can be used to determine the ROI, NPV, and payback period for the organization's investment in Oracle Real Application Testing. These are shown in Table 16 below.

Table 16
Cash Flow — Non-Risk-Adjusted

Summary	Initial	Year 1	Year 2	Year 3	Total	PV
Total costs	($1,107,450)	($242,880)	($291,456)	($349,747)	($1,991,533)	($1,831,893)
Total benefits		$2,709,950	$2,407,350	$2,764,230	$7,881,530	$6,529,943
Total	($1,107,450)	$2,467,070	$2,115,894	$2,414,483	$5,889,997	$4,698,050
ROI						256%
Payback period (months)						5.4

Source: Forrester Research, Inc.

Table 17 below shows the risk-adjusted ROI, NPV, and payback period values. These values are determined by applying the risk-adjustment values from Table 14 and Table 15 in the Risk section to the cost and benefits numbers in Tables 5 and 13.

Table 17
Cash Flow — Risk-Adjusted

Summary	Initial	Year 1	Year 2	Year 3	Total	PV
Total costs	($1,107,726)	($242,880)	($291,456)	($349,747)	($1,991,809)	($1,832,169)
Total benefits		$2,479,435	$2,181,591	$2,500,978	$7,162,004	$5,936,022
Total	($1,107,726)	$2,236,555	$1,890,135	$2,151,231	$5,170,195	$4,103,853
ROI						224%
Payback period (months)						5.9

Source: Forrester Research, Inc.

An Overview Of Oracle Real Application Testing

According to Oracle, Oracle Real Application Testing, an Oracle Database 11g Enterprise Edition option, allows organizations to deploy high-quality applications and database changes faster by streamlining their testing and quality assurance efforts. Oracle's unique architecture lets administrators automatically capture and replay real workloads with the exact timing and concurrency of production environments. As a result, businesses can mitigate risks by fully assessing the impact of changes to database systems before deploying them into production. With Oracle Real Application Testing, you can:

- Enhance the quality of service and system reliability by accurately validating changes prior to production deployment.

- Capture and replay real production workloads such as month-end, quarter-end, or peak seasonal workloads, to make "before and after" performance comparisons.

- Get predictable results and exact resolution of changes across the entire life cycle from testing to production.

- Upgrade existing Oracle databases faster with less effort and risk to take advantage of the new capabilities in Oracle Database 11g Release 2.

- Eliminate the need for error-prone manual scripting.

- Reduce operational costs by automating testing efforts.

Oracle Real Application Testing includes two solutions to test the impact of system changes on real-world applications:

- **SQL Performance Analyzer (SPA)** assesses the impact of system changes on SQL response time by identifying any variation in SQL execution plans and performance statistics resulting from the change.

- **Database Replay** allows system changes to be performed and analyzed in test environments by replaying a full production workload on the test system to help determine the overall impact of change on the workload.

Together, these two capabilities provide a comprehensive, flexible, and end-to-end solution for assessing the impact of changes to the database and its underlying infrastructure. Oracle Real Application Testing enables businesses to fully assess the outcome of a system change, whether proactively or during a performance degradation, in a test environment. Administrators can take corrective action if necessary before introducing the change safely and reliably into production — ultimately minimizing the risk and undesirable impact on service availability.

Appendix A: Composite Organization Description

Forrester created a Total Economic Impact (TEI) financial framework in order to generate the potential return-on-investment (ROI) baseline analysis for organizations considering deploying Oracle Real Application Testing. For this TEI study, Forrester aggregated the findings from four customer interviews and applied them to a composite organization to illustrate the quantifiable costs, benefits, and ROIs of implementing Oracle Real Application Testing. Based on those interviews, Forrester constructed a composite company that we will call Ace International.

Ace International

Ace International is a Fortune 500 conglomerate with core business interests in finance, telecommunications, travel, entertainment and lifestyle. Headquartered in New York in the US, the company employs 25,000 people around the world in 30 offices across 20 countries on four continents. The IT department consists of 200 people, including 9 database administrators (DBAs); like other corporate functions, it operates as a shared service for the company's various technology-driven businesses around the world. Among other responsibilities, the DBAs are in charge of administering, managing, and maintaining 85 mission-critical business applications and the 160 production databases that these applications run on. Ace International calculates that its database instances are growing at approximately 20% per year.

Forrester created this composite company to reflect an organization with the following characteristics:

- Ace International's CIO has a particular focus on profitability and prudent investment. As an internal service organization where margins are thin, cost efficiency is paramount without sacrificing quality or service levels. There is a strong impetus to decrease IT development and operational management costs, of which database testing is often considered to be the largest cost factor. Increasingly, IT executive management wants to find a solution that will allow valuable database engineers to be more time-efficient and devote more of their effort to strategic revenue-generating IT projects and directives while at the same time preventing the number of software coding defects being introduced into live production environments. Previously, this caused a number of publicized outages, resulting in lost customers and revenue opportunities. The IT management team has therefore directed the database testing group to resolve all issues before production performance and service levels are affected.

- To meet these directives, the database testing group is interested in finding a solution that allows testing in conditions as similar to the production environment as possible. In the past, the group has come under criticism for relying too heavily on traditional testing tools that provide synthetic or simulated workloads, which only provide 5% to 10% coverage of actual application workflows and key business transactions. However, the group simply lacks the dedicated resources to simply replicate the production environment and conditions.

- At Ace International, comprehensive database testing requires a lot of manual and extensive custom script writing, as well as executing thousands of queries whenever the database is updated or upgraded. This requires a great deal of time from skilled and experienced database administrators to perform very complex tasks such as database performance diagnostics, monitoring, database auditing, database optimization, and database schema adjustment. There is a strong desire to find solutions that will cut down on the amount of time and effort being devoted to testing without affecting the number of defects discovered.

- Ace International is also interested in finding a solution that minimizes adverse impacts from routine performance-related changes to their databases and preventing downtime of critical business applications. Currently, there is no comprehensive and automatic way to validate changes caused by routine DBA activities such as adding an index to a database table, gathering various database statistics, or changing memory settings.

- Database security is a big concern for Ace International, where corporate databases hold confidential and valuable corporate information in spite of the drive to keep costs low and minimize any testing not deemed absolutely crucial. The database QA team is required to conduct comprehensive testing routines in compliance with regulatory and industry standards. The QA team is also mandated to test and apply each quarterly critical patch update (CPU) issued for its databases, along with testing for security loopholes and prevention of unauthorized access.

Appendix B: Total Economic Impact™ Overview

Total Economic Impact is a methodology developed by Forrester Research that enhances a company's technology decision-making processes and assists vendors in communicating the value proposition of their products and services to clients. The TEI methodology helps companies demonstrate, justify, and realize the tangible value of IT initiatives to both senior management and other key business stakeholders.

The TEI methodology consists of four components to evaluate investment value: benefits, costs, risks, and flexibility.

Benefits

Benefits represent the value delivered to the user organization — IT and/or business units — by the proposed product or project. Often product or project justification exercises focus just on IT cost and cost reduction, leaving little room to analyze the effect of the technology on the entire organization. The TEI methodology and the resulting financial model place equal weight on the measure of benefits and the measure of costs, allowing for a full examination of the effect of the technology on the entire organization. Calculation of benefit estimates involves a clear dialogue with the user organization to understand the specific value that is created. In addition, Forrester also requires that there be a clear line of accountability established between the measurement and justification of benefit estimates after the project has been completed. This ensures that benefit estimates tie back directly to the bottom line.

Costs

Costs represent the investment necessary to capture the value, or benefits, of the proposed project. IT or the business units may incur costs in the 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: 1) the likelihood that the cost and benefit estimates will meet the original projections, and 2) the likelihood

that the estimates will be measured and tracked over time. TEI applies a probability density function known as "triangular distribution" to the values entered. At minimum, three values are calculated to estimate the underlying range around each cost and benefit.

Flexibility

Within the TEI methodology, direct benefits represent one part of the investment value. While direct benefits can typically be the primary way to justify a project, Forrester believes that organizations should be able to measure the strategic value of an investment. Flexibility represents the value that can be obtained for some future additional investment building on top of the initial investment already made. For instance, an investment in an enterprise wide upgrade of an office productivity suite can potentially increase standardization (to increase efficiency) and reduce licensing costs. However, an embedded collaboration feature may translate to greater worker productivity if activated. The collaboration can only be used with additional investment in training at some future point in time. However, having the ability to capture that benefit has a present value that can be estimated. The flexibility component of TEI captures that value.

Appendix C: Glossary

Discount rate: The interest rate used in cash flow analysis to take into account the time value of money. Although the Federal Reserve Bank sets a discount rate, companies often set a discount rate based on their business and investment environment. Forrester assumes a yearly discount rate of 10% for this analysis. Organizations typically use discount rates between 8% and 16% based on their current environment. Readers are urged to consult their respective organization to determine the most appropriate discount rate to use in their own environment.

Net present value (NPV): The present or current value of (discounted) future net cash flows given an interest rate (the discount rate). A positive project NPV normally indicates that the investment should be made, unless other projects have higher NPVs.

Present value (PV): The present or current value of (discounted) cost and benefit estimates given at an interest rate (the discount rate). The PV of costs and benefits feed into the total net present value of cash flows.

Payback period: The breakeven point for an investment. The point in time at which net benefits (benefits minus costs) equal initial investment or cost.

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

A Note On Cash Flow Tables

The following is a note on the cash flow tables used in this study. 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 Framework Assumptions section) 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.

Appendix D: Endnotes

[1] Forrester risk-adjusts the summary financial metrics to take into account the potential uncertainty of the cost and benefit estimates. For more information on risk, please see page 22.

[2] Source: Oracle Processor Core Factor (http://www.oracle.com/us/corporate/contracts/license-service-agreement/index.html).

[3] Source: Managing the Rapid Rise in Database Growth, 2011 IOUG Survey on Database Manageability. March 2011 (http://www.dbta.com/Downloads/Download.ashx?IssueID=3062).