

Microsoft SQL Server and Oracle® Database:

A Comparative Study on Total Cost of Administration (TCA)

A case study on the comparative costs of database administration for two of the premier enterprise relational database management systems.

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EXECUTIVE SUMMARY

In these tough and uncertain economic times lowering operational costs and total cost of ownership (TCO) has become a crucial factor for IT infrastructure decisions. While some factors such as purchase price and annual support are easy to measure, other key costs such as administrative labor are more difficult to differentiate between technology alternatives. Considering that on-going administrative costs often make up 70% of IT budgets, it is critical to measure and assess the alternative management costs between competing technologies.

This paper discusses the findings from several customer case studies conducted on the costs associate with managing two of the leading database management platforms from Microsoft Corp. and Oracle®. This research was in follow up to an earlier study conducted in 2006, *Microsoft SQL Server and Oracle® Database: A Comparative Study on Total Cost of Administration (TCA), Alinean 2006*. The first study conducted in-depth interviews with 100 Directors of Database Administration and Senior level Database Administrators regarding their database environments, user populations, and database administration activities. These follow up customer case studies focused on a dozen of the largest organizations to see how their use of the two database platforms for mission critical applications had changed and how the database administrative effort to manage these databases had changed.

The customer case studies revealed two major findings. First, while the use of Oracle databases remained relatively similar to previous observations, both the number and size of Microsoft SQL Server databases had increased significantly in the majority of organizations. Second, the difference in Total Cost of Administration (TCA) became even greater for the two database platforms than in the original study. The customer case studies demonstrated that on average a Database Administrator (DBA) could manage over 65 mission critical Microsoft SQL Server databases, while Oracle Database implementations required one DBA per 15 critical databases. Factoring in slightly higher average salaries for Oracle DBAs, the corresponding annual cost for administration for these two databases comes out to \$1,605 per year per database for Microsoft SQL Server and \$7,385 per year per database for Oracle Database; a 460% difference in annual cost of administration per database.

Key Results

Measure	Microsoft	Oracle
Average number of databases per company	1780	234
Average number of users per database ¹	165	216
Average database size (GB)	290	627
Mission critical databases	57%	53%
Web-based databases	54%	21%
Transaction-based databases	26%	47%
Decision-support databases	20%	32%
Databases supported per DBA ¹	65.4	15.2
Annual TCA per database	\$1,605	\$7,385

Table 1: Key findings reveal that Microsoft SQL Server has a TCA advantage over Oracle Database.

A key cost factor used for comparisons across case studies was the number of administrators per database. Other factors such as database size, complexity and transaction load were also observed to influence the total database management costs. However, due to inconsistencies in the measurement of these factors

¹ These measures exclude large Web deployments explained further in the paper.

across the case studies, they have been deemed as out of scope. Other costs including software licensing, server hardware costs and management utilities, which typically consume 40% or more of any database management project's costs, were also excluded from the customer case studies. While TCA per database should be a major consideration in selecting a database platform, it should not be the only consideration.

METHODOLOGY AND GOALS

There are two predominant methods for measuring the ease-of-use or productivity for alternative technologies. One approach is to conduct time-in-motion studies within a lab environment. Study participants are asked to accomplish similar tasks using the alternative technologies, while researchers measure the time required to complete assigned tasks. While this approach can measure the usability and number of operations required to complete a given task fairly precisely, it may not accurately reflect how people accomplish their daily activities on the job.

The other approach, used in these customer case studies, measures differences in effort based on real world results in similar environments. An original study conducted in 2006 surveyed one hundred (100) Directors of Database Administration and Senior Database Administrators from a wide variety of organizations representing fourteen different industries, and ranging from smaller companies with fewer than 300 employees to some of the world's largest companies with over 100,000 employees. The follow up customer case studies for this paper focused primarily on the larger organizations across eight industries including:

- Banking and Financial Services
- Insurance
- Technology
- Healthcare
- Energy
- Media and Entertainment
- Retail
- Chemicals

The organizations were asked a series of common questions regarding their database infrastructures and use, including the number of database servers installed, the average size of each database, and the number of users supported per database. Participants were also asked detailed questions regarding the overall level of effort required by database administrators to support the Microsoft SQL Server and Oracle Database servers, as well as the average time allocations for several key operational functions.

Database Profiles:

The participants interviewed for these customer case studies were primarily senior database administrators who were familiar with the database environments in their organizations and the work effort required to implement and manage the database systems. The majority of the customer case studies had both Microsoft SQL Server and Oracle Database servers installed in their organizations.

An important distinction to note was that only information on Mission Critical databases was included in the customer case study analyses. Mission Critical databases were defined as production systems crucial to the business operations of the organization such that interruption in service (downtime) for these systems would result in lost revenue, service interruptions for customers, or measurable productivity losses for employees. Based on this definition, customer case studies demonstrated on average that 57% of their Microsoft SQL Server databases were characterized as mission critical, while slightly fewer 53% of the Oracle Databases were classified as mission critical.

Database Application Usage

In these customer case studies, a marked difference was observed in the usage of the database platforms from a previous assessment. In several cases, the organizations had deployed very large numbers of SQL Server databases to support new Web initiatives. While the average annual growth rate for all new database deployments was 13.2%, the deployment of SQL Server databases for new Web applications was growing at 34% per year. Figure 2 shows the average growth rate for the database platforms by

application type. Overall, new Microsoft SQL Server databases were growing at 23.4% per year, while new Oracle Database deployments were growing by 8.8% annually.

Average Annual Growth Rate for Databases

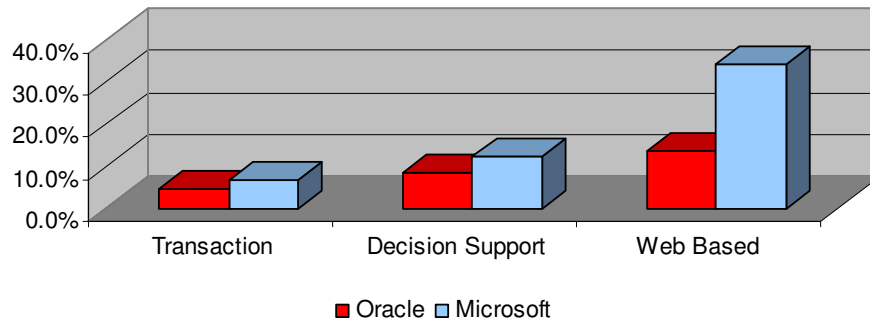


Figure 2: Average Annual Growth Rate for Databases

The significant growth in SQL Server databases for Web applications shifted the average usage for the different database platforms. Over half (54%) of the SQL Server databases were now supporting external facing Web applications. By contrast over 75% of the Oracle databases were supporting traditional internal facing transaction based applications such as ERP and decision support applications. Figure 3 below shows the types of usage for the database platforms.

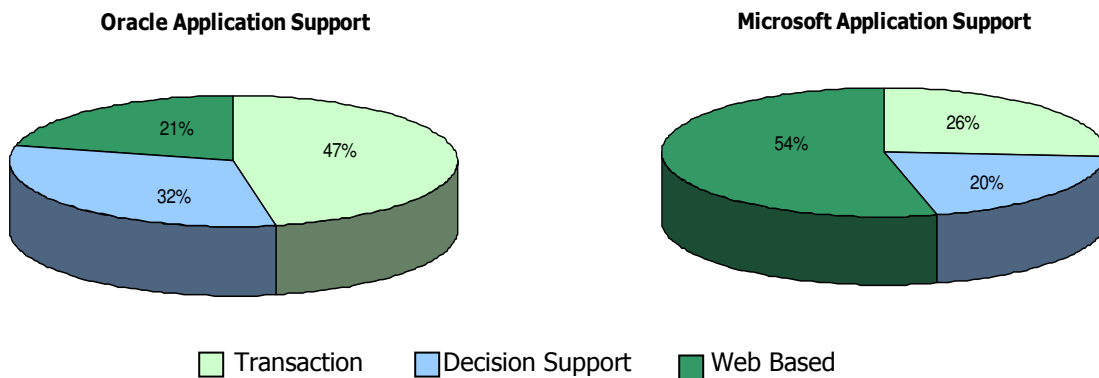


Figure 3: Database Application Usage by Platform

Number of Databases per Company

A major factor influencing the number of databases supported per database administrator was the total number of databases deployed within the organization. Several organizations had several thousand databases deployed for Web applications, retail stores and branch offices. The majority of these very large deployments were for SQL Server. Sixty percent (60%) of the customer case study organizations had over one thousand (1000) SQL Server databases deployed. By contrast fifty percent (50%) of the organizations had fewer than one hundred (100) Oracle databases deployed. Figure 4 shows the distribution of database deployments among the customer case studies.

Number of Databases per Company

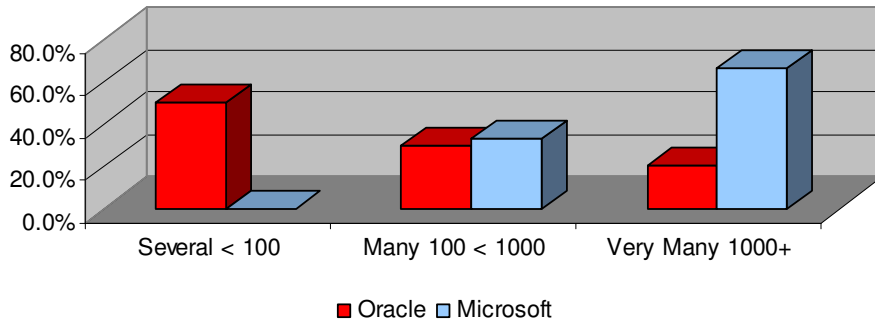


Figure 4: Number of Databases per Company

Database User Populations

The number of users accessing a database often influences the amount of effort required for supporting the database. The customer case studies showed a high correlation between the application type for the databases and the user population for those databases. Databases used for branch offices or retail stores typically had 30 to 50 users, while databases supporting Web based applications often had several thousand registered users.

In order to better understand the true differences in the user populations for the two database platforms, the customer case studies concentrated on the internal transaction based systems and the decision support systems, and set aside the characteristics of the very large database deployments. For these internal focused applications the user populations were fairly similar for the Microsoft and Oracle databases. On average the Microsoft SQL Server databases supported 187 users for transaction based applications and 43 users for decision support systems. The Oracle databases averaged 234 users for transaction based applications and 57 users for decision support applications. Figure 5 shows the total distribution of user populations for the database platforms.

Average Users per Database

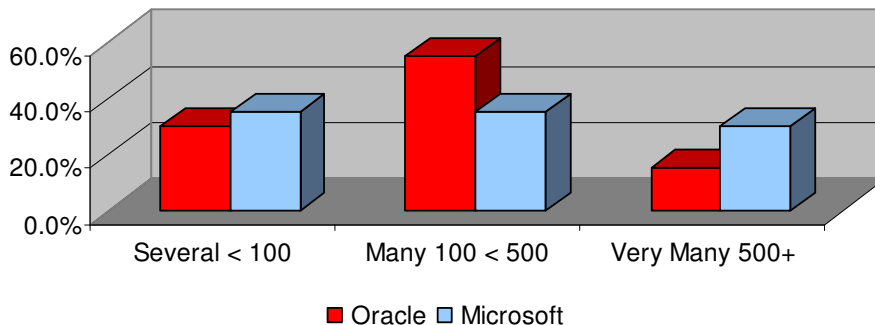


Figure 5: Average Users per Database by Platform

Database Sizes

In addition to the user population, the size and complexity of a database typically influence the effort required for database administration. Again, the application type for the database had a strong correlation to the database size in many cases. Databases used for distributed retail and branch office functions tended to be fairly small, averaging less than 100 GB. Databases supporting decision support applications were the largest averaging 643 GB for Microsoft SQL Server and 1.23 TB for Oracle Database. The size of the databases supporting both internal transaction based applications and external Web based applications

varied considerably in size, ranging between less than 100 gigabytes to several terabytes. On average the Oracle databases were over twice as large as the Microsoft SQL Server databases in this area, with Oracle transaction based databases averaging 627 GB and Microsoft SQL databases averaging 290 GB. Figure 6 shows the distribution of sizes for the database platforms.

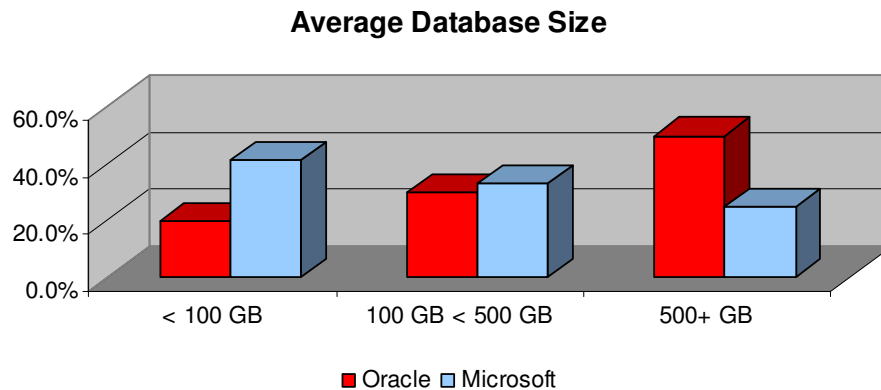


Figure 6: Average Database Size by Platform

STUDY RESULTS

Key Ratios

The most important factor in measuring the Total Cost of Administration (TCA) for the two database platforms is the ratio of databases per administrator. Because some organizations had an extremely large number of databases, the customer case studies measured TCA across all databases as well as across a subset of databases used for traditional transaction based applications and decision support applications.

Including all databases the average ratio of databases per Microsoft SQL Server administrator was 214, while the average number of databases per Oracle administrator was 31. When the customer case studies excluded the large database deployments for retail, branch offices and large Web applications these comparisons became closer. For traditional transaction based applications and decision support applications the number of databases per Microsoft SQL Server DBA was 65, while the number of databases per Oracle DBA was 15.

Database Administrator Salaries

The total cost of administration is based on the average annual fully loaded cost per database administrator divided by the number of databases managed per DBA. Since salaries can vary widely based on industry and geography the average salaries were based on publicly available national salary survey information, rather than directly from each organization in the customer case studies.

Analysis of the customer case studies used publicly available data from PayScale for the base salaries of junior, associate and senior level database administrators. Junior level DBAs were defined as individuals with less than five (5) years of experience. Associate level DBAs had between five and eight (5 – 8) years of experience, and senior level DBAs had greater than eight (8) years of experience.

In a previous study it was found that on average Oracle DBAs were paid slightly more than their Microsoft counterparts with similar levels of experience. The latest salary information, though, demonstrated minimal differences in salaries for DBAs on the different platforms and the advantages varied by location. In some cities Oracle DBAs were paid more than Microsoft DBAs, while in other cities Microsoft DBAs were paid slightly more. To compensate for these regional differences the salary information for six major metropolitan areas; Chicago, Los Angeles, Atlanta, Dallas, St. Louis and Philadelphia was averaged for the customer case study analyses. According to PayScale the average base salary for a junior DBA is \$71,785

per year. The average salary for a certified associate level DBA is \$78,475 per year, and the average base salary for a senior level certified DBA is \$88,370.

To provide for a single weighted average annual cost per DBA for the customer study financial analyses, the average base salary information was combined with the experience levels reported by organizations, and an average burden rate of 26% for the United States. The burden rate accounts for additional costs beyond the employee’s base salary including; taxes, insurance, facility expenses and paid time off. Figure 7 shows the distribution of experience levels for the database platforms across the customer case studies. Nearly three fourths (74%) of the Oracle DBAs were seniors with more than eight years of experience. Meanwhile, the majority of Microsoft DBAs (61%) were associates with between five and eight (5 – 8) years of experience. Very few of the DBAs had less than five years of experience.

Based on experience levels the average weighted base salary for the Oracle DBAs came to \$85,605, while the less experienced Microsoft DBAs average weighted salary was \$81,190. Applying the 26% burden rate to these base salaries yielded a fully burdened annual cost of \$107,863 for Oracle DBAs and \$102,299 for Microsoft DBAs.

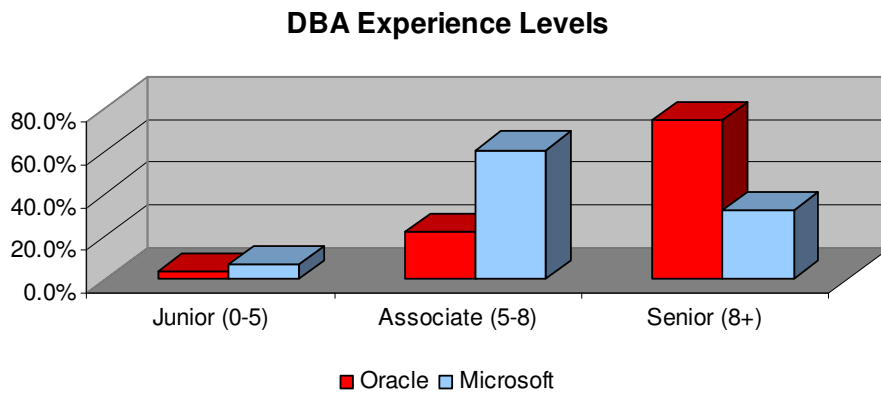


Figure 7: Average Database Administrator Experience Level by Platform

DBA Training

In addition to direct compensation, another significant employee expense for high skilled professions in the technology industry is on-going education. The customer case studies demonstrated slightly higher costs and time commitments for the Oracle DBAs than for Microsoft DBAs for annual training costs per DBA and the annual hours devoted to training. On average Microsoft DBAs spent 47 hours per year in dedicated database administration training classes, at an annual cost of \$2,695 per DBA. Oracle DBAs spent more time and effort on training with 53 hours in classes, at a cost of \$4,385 per DBA.

Financial Assessment

To compute the Total Cost of Administration (TCA) for the different database management systems in the customer case study analyses the total annual cost per DBA was divided by the average number of databases managed per DBA. Table 8 shows these calculations for the respective database platforms.

Database	Average Burdened DBA Salary	Annual Training Cost per DBA	Total Annual Cost per DBA	Databases per DBA	Total Cost of Administration per Database
Microsoft	\$102,299	\$2,695	\$104,994	65.4	\$1,605
Oracle	\$107,863	\$4,385	\$112,248	15.2	\$7,385

Table 8: Total Cost of Administration (TCA)

New Database Deployments

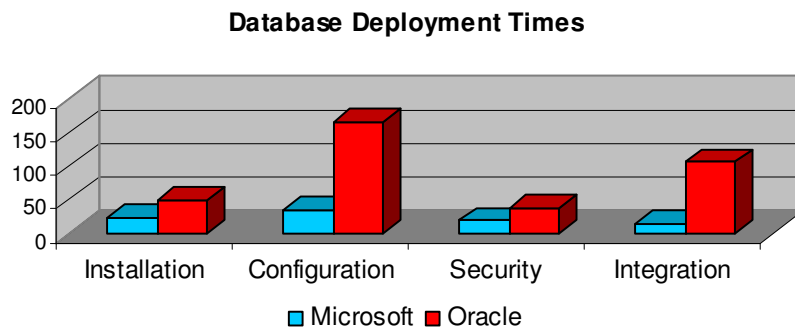
A key factor influencing the analyses of the customer case studies, and a difference from previous study observations, came from the rapid deployment of new database servers. Two thirds (2/3) of the organizations deployed more than 100 new database servers per year. The majority of these new databases were in support of external facing Web applications. A majority of the organizations, 63%, had standardized on SQL Server for new Web applications, while a quarter, 25%, of the organizations favored Oracle Database. Some organizations, 12%, were choosing the database platform on a project by project basis.

The result of this significant growth in primarily SQL Server databases demonstrated a shift in two primary measurements; the number of databases per DBA, and the percentage of time DBAs were spending on deploying new applications versus managing the current infrastructure. On average the SQL Server DBAs were spending 41% of their time deploying new database servers, with some organizations spending as much as 80% of their SQL DBA resources on new database deployments. In contrast, on average 21% of Oracle DBA time was spent on new database deployments.

While the SQL Server DBAs were spending a greater percentage of their time deploying new databases, they were deploying many more databases and doing it more quickly than their Oracle DBA counterparts. On average the SQL Server DBAs were deploying almost 2 new databases per month, or 23.5 per year, while the Oracle DBAs were deploying just over one new database per quarter or 4.2 databases per year.

Database Deployment Effort

Organizations reported a wide range of times from less than half of an hour to over a week for the effort required to deploy new mission critical database servers. On average SQL Server DBAs were able to install and configure new database servers in 1.5 hours, while Oracle DBAs took 6 hours on average. Table 9 shows the average times in minutes for the various tasks involved in the deployment of new database servers.



Database	Installation	Configuration	Security	Integration	Total
Microsoft SQL Server	22	34	18	14	88
Oracle Database	48	165	38	106	357

Table 9: Database Deployment Times (in minutes)

The following are the definitions of the tasks used across customer case studies.

- Installation – Initial installation of database software on the server
- Configuration – Creation of database schema and specification of database instance settings
- Security – Definition of security settings for the database, including access control
- Integration – Integration of the database with the infrastructure, including backup processes

Key Task Findings

In addition to the overall ratio of databases per DBA, customer case studies also reviewed how the DBAs were spending their time to determine if there were any differences in manageability between the platforms. Time was spent on the following activities.

- » Deploying new database servers
- » Problem diagnosis and resolution
- » Database tuning
- » Updating database schema
- » Applying patches and upgrades
- » Security administration and access control
- » Backup and recovery
- » Reporting
- » Documentation and governance

Figure 10 shows the average percentage of time the database administrators reported spending on the various activities. The biggest difference between the platforms came in the areas of deploying new databases, problem resolution and tuning. The Microsoft DBAs spent almost twice as much time deploying new database servers 41%, compared to 21% for their Oracle DBA counter parts. Meanwhile the allocation of time for problem resolution and tuning was almost the exact opposite with Oracle DBAs spending on average 33% of their time on these reactive tasks compared to 18% for Microsoft DBAs. Other than these three key activities the allocation of time for the other major database administration functions was fairly similar between the two database platforms.

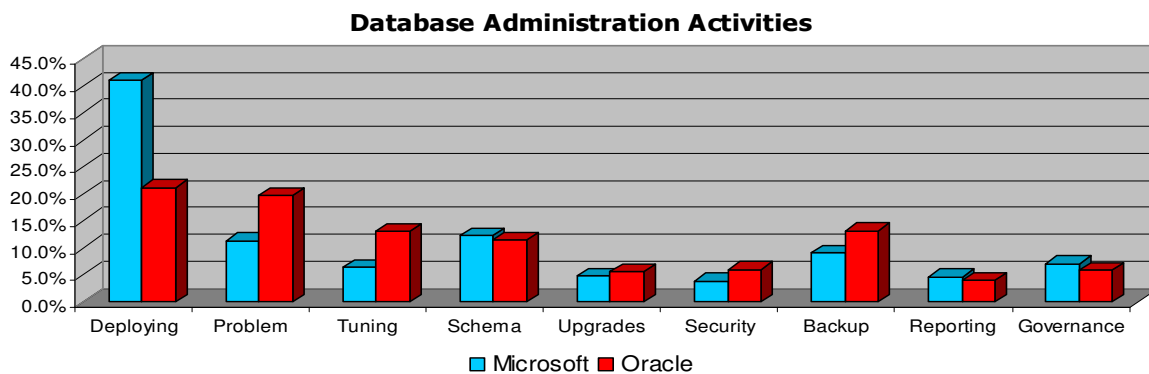


Figure 10: Database Administration Activities

Simplifying Database Administration

In SQL Server 2008 Microsoft introduced a new Policy Based Management (PBM) capability for simplifying and improving the consistency of managing multiple database instances. The new PBM facility allows database administrators to define common policies to apply across a designated set of servers. PBM supports automation for consistently enforcing the policies, and reporting for easily identifying any policy exceptions. Policies can be defined for a wide variety of database attributes. The customer case study organizations were primarily using PBM for enforcing naming conventions, security policies and server maintenance routines such as backup operations.

As a new capability first introduced in SQL Server 2008, only one third (33%) of customer case study organizations reported using Policy Based Management in production environments. Some organizations were not using PBM since it only supports SQL Server 2008 natively, and at the time of the customer case studies, organizations were just starting to deploy SQL Server 2008 for production applications. A couple of organizations had already created similar in-house utilities, but were considering replacing these with PBM.

The users of PBM reported productivity gains from 25% to 60% for deploying new servers and insuring corporate governance. Users could define security policies and backup operations centrally and enforce

them automatically on hundreds of servers. The organizations which were using PBM saw it as a key differentiator for being able to manage large numbers of databases.

Most of the organizations which were using PBM strongly endorsed a utility provided by the CodePlex - Enterprise Policy Management Framework project. The utility provides a web based interface for PBM and a robust set of predefined policies. The utility also extends PBM support for back level SQL Server 2000 and SQL Server 2005 database instances.

CONCLUSION

As organizations continue to deploy an ever increasing number of applications for improving internal operations and better serving customers, it is essential that they choose technologies which can scale in size, workload and number. The customer case studies revealed that organizations have been able to easily grow the size of their SQL Server databases to accommodate increased workloads, while managing the deployment of hundreds and even thousands of SQL Server database instances. Compared to their Oracle DBA counterparts, the SQL Server DBAs in these customer case studies were able to manage four times as many databases on average, yielding a \$5,779 lower annual Total Cost of Administration per database.

In addition to managing more databases, the SQL Server DBAs were spending a much higher percentage of their time deploying new databases in support of business applications compared to the Oracle DBAs. As organizations try to shift IT resources from maintaining existing systems to enabling innovation and business advantage, capabilities such as the new Policy Based Management feature in SQL Server 2008, which simplifies the management of multiple database instances, should continue to grow in importance.

While these customer case studies focused on the key ratio of databases per administrator as the primary measure of manageability, readers should consider that there are other factors such as database size, complexity, and workload, which could influence total database management costs. Additionally, software licensing, server hardware costs and management utilities typically consume 40% or more of any database management project's costs. While TCA per database should be a major consideration in selecting a database platform, it should not be the only consideration.

ABOUT ALINEAN

Since 1994, the Alinean team has been the pioneering builder of tools to help quantify and improve the ROI and TCO of IT investments. Alinean was named for the Spanish word for "Align", matching the Alinean mission as the leading developer of analytical tools to help IT vendors, consultants and IT executives align IT investments with business strategies.

The Alinean team has over a decade of experience in the practical development and application of ROI and TCO methodologies, models and tools to optimizing IT investment decision making. In 1994, the Alinean team formed Interpose, the original pioneers of ROI tools, developing analytical software for over 50 major IT vendors and consulting companies worldwide, and creating the industry standard TCO Manager and TCO Analyst software. Interpose was sold to Gartner in 1998, where the team continued their developments and marketing of ROI and TCO software tools. The original team reunited to form Alinean in 2001, once again becoming the leading pioneers and developers of ROI sales and analytical tools. Current customers include leading IT solution providers such as HP, IBM, Dell, Intel, Symantec, NetIQ, EMC, SAP, Oracle, SBC, and Microsoft, as well as leading consultancies and Global 1000 companies.

Additional information about Alinean and helpful ROI educational resources can be found at <http://www.alinean.com>.