



# **SQL Server 2008 Business Intelligence**

## White Paper

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**Summary:** SQL Server 2008 makes business intelligence available to everyone through deep integration with Microsoft Office, providing the right tool, to the right user, at the right price. Employees at all levels of an organization can see and help to influence the performance of the business by working with tools that are both easy to use and powerful. Integration with the 2007 Microsoft Office System enables users to view business performance in a way that they are familiar with. The introduction of PerformancePoint® Server 2007, helps customers gain actionable insight into the entire organization so they can monitor, analyze, and plan their businesses, as well as drive alignment, accountability, and actionable insight across the entire organization.

For the latest information, see [Microsoft SQL Server 2008](#).

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## Introduction

In an increasingly competitive marketplace, businesses are realizing that they can only succeed by proactively identifying market trends and opportunities, and by responding rapidly to new customer demands. Additionally, employees must prioritize business activities and expenditure to ensure the most efficient use of the available resources and make effective business decisions.

To meet these challenges, employees need to gain actionable insight into the business so that they can make intelligent, informed decisions and contribute to business success. Organizations want to embed this insight into everyday business activities so that all employees are engaged, either explicitly or implicitly, in acting on the results of analysis of a complete and consistent version of all enterprise data.

### Microsoft Business Intelligence Technologies

Microsoft provides a comprehensive Business Intelligence (BI) offering that is based on a scalable data platform for data integration, data warehousing, analysis, and reporting, including powerful and intuitive tools that end users can use to access and analyze business information. At the core of the Microsoft BI end-to-offering is Microsoft® SQL Server® 2008, a complete data platform that enables you to:

- Unify storage and access for all data across the enterprise.
- Build and manage sophisticated BI solutions.
- Increase the reach of your business intelligence solution to empower all employees.

The specific technologies of SQL Server 2008 that form the basis of this powerful BI offering are described in the following table.

Component	Description
SQL Server Database Engine	A scalable, high-performance data storage engine for extremely large volumes of data making it an ideal choice for consolidating business data from across the enterprise into a central data warehouse for analysis and reporting
SQL Server Integration Services	A comprehensive platform for extract, transform, and load (ETL) operations that enables the population and synchronization of your data warehouse with data from the disparate data sources that are used by your business applications throughout the organization
SQL Server Analysis Services	Provides an analytical engine for Online Analytical Processing (OLAP) solutions, including business measure aggregation over multiple dimensions and key performance indicators (KPIs), and for data mining solutions that use specialized algorithms to identify patterns, trends, and associations in business data

Component	Description
SQL Server Reporting Services	An extensive reporting solution that makes it easy to create, publish, and distribute detailed business reports both within the enterprise and outside the enterprise

While SQL Server 2008 delivers a comprehensive BI platform, it is through deep integration with productivity tools, such as the 2007 Microsoft Office System, that you can empower employees throughout the enterprise to use this platform and turn business insight into effective actions.

## 2007 Microsoft Office System Integration

The SQL Server 2008 BI platform reaches information workers through the following 2007 Office System components:

**Microsoft Office Excel.** Microsoft Office Excel® 2007 is a powerful spreadsheet application that you can use as an interface for OLAP analysis, data mining, and report rendering. Through deep integration between SQL Server 2008 and Excel 2007, you can:

- Enhance the end user's ability to access and analyze data from SQL Server 2008 Analysis Services. With Excel 2007, end users can browse data that is stored in multidimensional OLAP cubes in Analysis Services. Excel 2007 enables users to easily build Microsoft PivotTable® dynamic views to "slice and dice" data any way they wish through the tools that are already installed on most desktop computers.
- Gain more value from your Excel implementation by using the tight integration between Excel and Analysis Services that enables end users to easily use the Analysis Services features, such as translations, Key Performance Indicators (KPIs), calculated members, named sets, and the server actions in Excel that turn Excel into an analytical client.
- Make predictive analysis available to everyone and enable non-technical users to harness the highly sophisticated data mining algorithms of SQL Server 2005 Analysis Services within the familiar environment of Office. Designed with the end user in mind, Data Mining Add-Ins for Office 2007 empowers end users to perform complex analysis directly in Excel and Microsoft Office Visio®.
- Add automatic analysis features, such as highlighting exceptions where data seems to differ from patterns in other areas of the table or data range, forecasting future values based on current trends, analyzing what-if scenarios, and determining what must change to meet a specific goal.
- Deliver reports in the format preferred by most end users by using the new and enhanced Reporting Services Excel rendering capabilities, which enable end users to receive reports directly in Excel.

**Microsoft Office Word.** Microsoft Word is a word processing application that you can use as a format for reports. Use the new, highly requested report renderer for Word, which enables you to render SQL Server 2008 Reporting Services reports in Word format.

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**Microsoft Office Visio.** Visio is a drawing and diagramming application that you can use to annotate, enhance, and present your data mining graphical views. With SQL Server 2008 and Visio 2007, you can:

- Render decision trees, regression trees, cluster diagrams, and dependency nets.
- Save data mining models as Visio documents embedded in other Office documents or saved as a Web page.

**Microsoft Office SharePoint Server.** SharePoint® Server is comprehensive collaboration, publishing, and dashboard solution that you can use to provide one central location for placing all your enterprise-wide BI content and tools, so that everyone in your organization can view and interact with relevant and timely analytical views, reports, and KPIs. The integration of SQL Server 2008 Reporting Services with SharePoint Server 2007 enables you to:

- Use one consistent user interface to manage and view reports.
- Track versions and workflow of reports when they are stored in SharePoint Server 2007 document libraries.
- Manage a single security model for reports through the SharePoint document library.
- Use the SharePoint Server 2007 out-of-the-box Report Center template to easily build a site to store reports.

**Microsoft Office PerformancePoint Server.** PerformancePoint® Server is an integrated performance management application that employees can use to monitor, analyze, and plan business activities based on the analytical data provided by SQL Server 2008.

This white paper shows how SQL Server 2008 and its integration with the 2007 Office System can help you unify business intelligence data storage and access, build and manage sophisticated BI solutions, and extend the reach of those solutions to all of your employees.

## Unifying Data Storage and Access

Most organizations have multiple business systems, each with its own dedicated data store. Although you can often generate reports from individual applications and perform analysis on the data they contain, you can only achieve complete and consistent insight into the business by consolidating disparate data throughout the enterprise to create a central source of business data for reporting and analysis.

### Consolidating Corporate Data for Analysis and Reporting

SQL Server 2008 supports two common approaches to unifying business data for analysis and reporting:

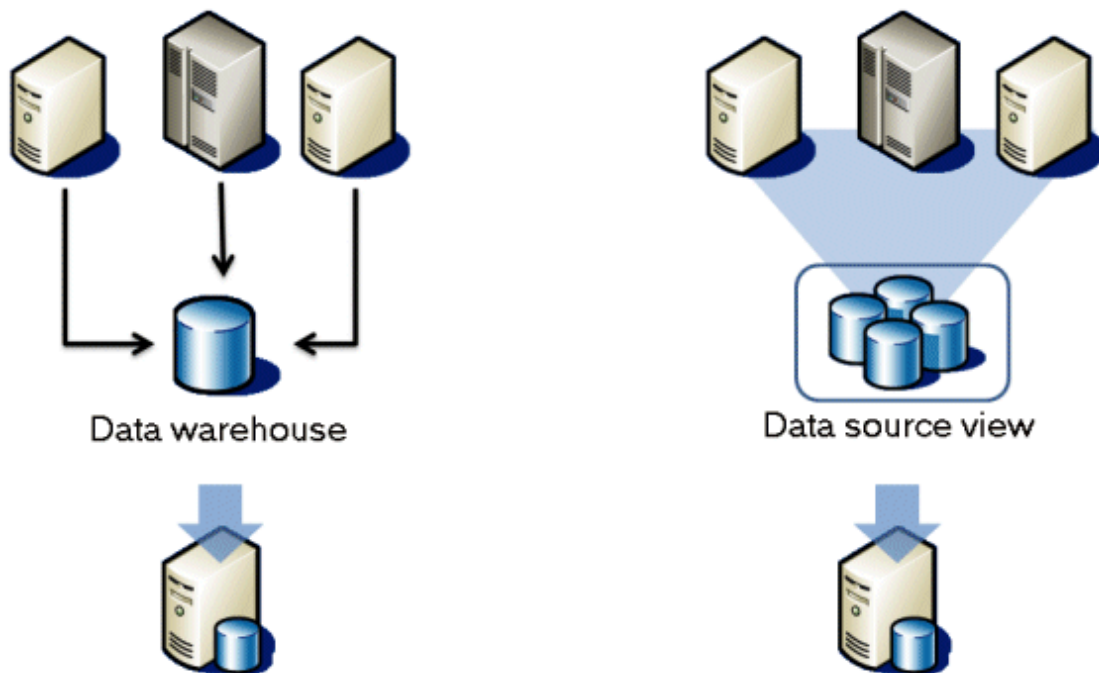
- **Data warehouse.** A data warehouse is a dedicated data store for enterprise-wide data, which is populated and synchronized with business data from disparate data sources throughout the enterprise. The key advantage of this approach is that you can design the

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data warehouse for optimal analytical and reporting performance with no impact on the performance of the line-of-business applications from which the data originates. Another advantage is that you can clean and consolidate data that comes from multiple sources into a single consistent version of the truth.

**Data source abstraction.** SQL Server 2008 Analysis Services enables the creation of data source views to provide an abstraction layer over one or more data sources. You can then use the data source view as a single source for Analysis Services, Integration Services, and Reporting Services. With a data source view, the data is retrieved from the underlying source systems when analysis occurs or a report is generated. This enables real-time analysis of the data in your business applications. Additionally, the data source view through its added layer of abstraction can be used to create friendly names to replace long or cryptic table names.

These approaches are shown in the following illustration. With SQL Server 2008, you can use either one or a combination of the two.



### Work with All of Your Data the Way You Want to

Regardless of which approach you take to unify your business data, SQL Server 2008 builds on its strong legacy of support for both relational and non-relational data by providing data types that enable developers and administrators to efficiently store and manage unstructured data such as documents and images, so you can store, manage, and analyze data in the format that best suits your business.

SQL Server 2008 includes enhanced support for XML data storage as well as a FILESTREAM data type that enables large binary data to be stored in the file system yet remain an integral part of the database with transactional consistency. Additionally, restrictions on the size of user-defined data types have been removed, which makes it possible to exceed the 8-KB limit imposed in earlier releases of SQL Server. Support for spatial and location data types

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makes it possible to store and analyze geographical data that conforms to industry standards.

### **Integrate All Enterprise Data Sources**

SQL Server 2008 data source views enable integration of data and access to data that originates from heterogeneous enterprise-wide data stores, such as SQL Server, Oracle, DB2, and Teradata. These views also provide an OLAP store of enterprise scale; the breadth of support for diverse data sources in SQL Server Integration Services means that you can extract data from all kinds of existing business applications. Therefore, unifying the data in all of your enterprise data sources is easy to accomplish, regardless of whether you want to build an abstraction layer through a data source view or use an ETL process to synchronize a dedicated data warehouse for analysis and reporting.

Additionally, through support for Web services and the Microsoft .NET Framework, SQL Server 2008 supports interoperability with multiple platforms, applications, and programming languages, so you can maximize your investment in new and existing systems by integrating and connecting your disparate data sources. Support for existing and emerging open standards, such as HTTP, XML, SOAP, XQuery, and XSD, further facilitate communication across your extended enterprise systems.

### **Data Warehouse Performance**

SQL Server 2008 provides a comprehensive and scalable data warehouse platform that enables your organization to integrate data into the data warehouse faster so you can scale and manage growing volumes of data and users.

### **Optimize ETL Processes**

Data warehouses are usually populated and updated with data from source systems through an ETL process. After the initial load of data into the data warehouse, periodic refreshes of new and changed data from the source systems are performed to ensure that the data warehouse is up-to-date.

SQL Server Integration Services provides a comprehensive platform that you can use to extract data from diverse source systems, make any required transformations to the data or its structure and format, and then load the transformed data into the data warehouse. Performing lookups to match records from source systems to existing records in the data warehouse is a common operation in ETL processes, and in SQL Server 2008 the performance of lookups has been significantly improved so that these operations scale to extremely large tables.

To help track data changes and ensure data warehouse consistency, SQL Server 2008 introduces *change data capture* functionality to log updates in change tables, which makes it easy to identify rows that have been modified and to determine the details of the modification and its cause.

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## **Manage Hardware Resources Efficiently**

Through support for data compression, SQL Server 2008 enables you to store your data more effectively and reduce storage costs. In addition, the compression significantly improves performance for large input/output bound workloads. SQL Server 2008 also provides native support out-of-the-box for backup compression. Additionally, the VARDECIMAL data type and new sparse columns in SQL Server 2008 help you get the most efficiency from your disk storage resources by reducing the amount of space that is required for the large tables that contain the predominantly numeric or NULL values that are often found in data warehouses.

In addition to efficiencies in data storage, SQL Server 2008 supports dynamic allocation of Address Windowing Extensions (AWE) mapped memory that supports up to 64 gigabytes of memory with Windows Server® 2003, Datacenter Edition, and 2 terabytes with the 64-bit edition, to support large data warehouse environments.

SQL Server 2008 also introduces Resource Governor, which enables administrators to define resource limits and priorities for different workloads, so that concurrent workloads can provide consistent performance and make it possible to manage resource contention issues proactively.

## **Optimize Database Performance**

SQL Server 2008 includes a high-performance relational database engine that enables you to build highly effective data warehouse solutions. Innovations, such as query optimizations for star schemas and tools to help you tune indexes and data structures, make SQL Server a natural choice for a heavily queried data warehouse. With the introduction of the MERGE Transact-SQL statement in SQL Server 2008, developers can more effectively handle common data warehousing scenarios, such as checking whether a row exists and then executing inserts or updates. Additionally, an extension to the GROUP BY clause enables users to define multiple grouping in the same query. Grouping Sets produce a single result set that is equivalent to a UNION ALL of differently grouped rows, which makes aggregation querying and reporting easier and faster.

SQL Server 2008 supports partitioned tables to help you optimize the performance and management of large tables, and with new support for partitioned table parallelism, you can significantly optimize a data warehouse by using partitioned tables.

## **Building and Managing Sophisticated BI Solutions**

As organizations demand ever increasingly complex analytics, the need to be able to build and deliver effective BI solutions quickly and to reduce the management overhead of your BI infrastructure has become a major consideration. SQL Server 2008 includes innovative tools that increase

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developer productivity and manageability, which enables faster capitalization on new analysis and reporting capabilities while incurring reduced administrative overhead.

## **Developer Productivity**

SQL Server 2008 simplifies the development of business intelligence solutions. BI developers benefit from easy-to-use utilities and tools that increase control and automate routine, time-consuming tasks, and can use the productivity features of SQL Server 2008 to create effective analysis and reporting solutions more quickly than ever; so your organization can take advantage of them sooner.

### **Use a Rich, Modern Programming Environment.**

Through tight interoperability with Microsoft Visual Studio®, developers can easily build and maintain robust, secure, scalable BI applications. SQL Server Business Intelligence Development Studio offers a single tool that covers multiple types of BI solution and provides a single, consistent environment for developing ETL, analysis and reporting solutions. Intuitive BI wizards that are delivered as part of the Business Intelligence Development Studio make it easy for even novice developers to build advanced Business Intelligence models and projects.

By embedding the common language runtime (CLR) in the database engine, SQL Server 2008 enables developers to choose from a variety of languages to develop applications, including Transact-SQL, Microsoft Visual Basic®, and C#. This flexible environment enables developers to use their existing skills to efficiently develop database applications.

When integrated with Visual Studio, the development experience across all of the SQL Server 2008 BI technologies is optimized for providing a true application development environment that supports the full project development life cycle (develop, test, deploy, modify, and test).

### **Implement Best Practice Solutions**

Enabling developers to build solutions more quickly is only effective if those solutions are optimally designed. To help ensure the best possible performance and correct functionality, SQL Server 2008 includes the following development environment features that promote best practices and help developers create effective analysis solutions:

- A consistent development environment for all BI solutions, including Analysis Services, OLAP, and data mining applications.
- Built-in support for the full development lifecycle, including design, build, debug, and deploy operations; and support for team-based development through integrated support for source control.
- A number of intuitive designers and wizards that make it easy to create Analysis Services solutions quickly.

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- An attribute relationship designer that includes built-in validations to help in creating optimal dimension designs.
  - A dimension editor that has been slimmed down to provide better productivity and the presence of parent child relationships is automatically detected.
  - A cube designer that has been streamlined and improved to provide better detection and classification of attributes along with identification of member properties.
  - Aggregation of individual partitions, which enables you to optimize measures from different periods or areas.
  - The aggregation designer has a new algorithm to help create initial aggregations. The aggregation designer is optimized to work with usage driven aggregations. You can now look at the aggregations that have been created and add to those aggregations or remove them. Intelligent support is provided to help with merging existing and new aggregation designs.

Additionally, SQL Server 2008 provides AMO warnings to alert developers when their design breaks one of over 40 best practices. These warnings are integrated into real-time designer checks, and provide a non-intrusive way for developers to detect potential problems with their design.

### **Increase Reporting Flexibility**

Reporting is a significant element of any BI solution, and business users are demanding increasingly complex reports. SQL Server Reporting Services provides the following features to make it easy to build reporting solutions:

- A Visual Studio-based report development interface in Business Intelligence Development Studio that developers can use to build, debug, and deploy reports.
- A business-focused report development tool named Report Builder that business users can use to create and deploy reports.
- A wide range of data display structures, including tables, matrices, lists, and charts.

Additionally, SQL Server 2008 includes extensive enhancements to Reporting Services that improve reporting performance and provide increased flexibility for formatting and publishing reports. One of the enhancements made to Reporting Services in SQL Server 2008 is support for a new layout structure that combines table and matrix data regions into a new Tablix data region. Tablix enables developers to generate reports that combine fixed and dynamic rows. Previously, layouts of this kind had to be developed by using multiple matrix data regions and shrinking row headers. Support for Tablix data regions simplifies the inclusion of combined static and dynamic data in reports, and extends the formatting and layout capabilities of Reporting Services significantly.

### **Manageability**

Through innovations such as a unified management tool, enhanced self-tuning capabilities, and a powerful management programming model, SQL Server 2008 extends the SQL Server ease-of-use leadership and increases

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the productivity of database administrators (DBAs). These enhancements enable DBAs to focus on high value tasks, like database architecture, while spending less time on routine maintenance, configuration, and tuning.

### **Use a Single, Unified Tool**

SQL Server 2008 provides DBAs with SQL Server Management Studio; a single, unified management tool that provides integrated management of Analysis Services, Reporting Services, Integration Services, and multiple versions of SQL Server, from the same interface for increased DBA productivity, flexibility, and manageability across extended SQL Server implementations.

### **Monitor Data Warehouse Resources**

SQL Server 2008 includes performance data collection and warehousing, which enables monitoring and reporting of resources across your data services solution.

## **Enterprise Scalability**

A key factor related to the successful delivery of truly sophisticated BI solutions requires sustained developer productivity and manageability even through large-scale implementations. Furthermore, the infrastructure must provide performance-related scalability, which in SQL Server 2008 has achieved a wide variety of investments that are focused on ensuring this enterprise-scale sustainability even through the largest scale of BI implementation.

### **Scalable Analytics**

The premise of Online Analytical Processing (OLAP) is that instant access to accurate information enables end users to answer even the most complex questions at the speed of thought. Thus, the aim to continuously excel in providing even faster query times and data refresh rates is a priority during the development process of any SQL Server Analysis Services release, an aim that naturally also has been driving the release of SQL Server 2008 Analysis Services.

SQL Server 2008 includes Analysis Services that enable you to drive broader analysis with enhanced capabilities, including complex computations and aggregations. Analysis Service provides enterprise-scale performance through:

- **A flexible caching model.** With Analysis Services, you can control how data and aggregations are cached to optimize query performance while maintaining an acceptable level of latency between the cache and its underlying data store.
- **Declarative attribute relationships.** In an Analysis Services dimension, you can explicitly declare relationships between attributes in a hierarchy. This enables Analysis Services to pre-generate aggregations when a cube or dimension is processed, which improves runtime query performance.

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- **Block computation.** Block computation eliminates unnecessary aggregation calculations (for example, when the values to be aggregated are NULL) and provides a significant improvement in analysis cube performance, which enables users to increase the depth of their hierarchies and complexity of computations.
  - **Write-back to MOLAP.** Analysis Services 2008 removes the requirement to query ROLAP partitions when performing write-backs, which results in huge performance gains.
  - **Scale-out Analysis Services.** A single read-only copy of an Analysis Services database can be shared between many Analysis Servers through a virtual IP address. This creates a highly scalable deployment option for an Analysis Services solution.
  - **Execution plan persistence.** SQL Server 2008 provides functionality to lock down query plans so that, to the maximum extent possible for correctness, the query plans survive server restart, server upgrade, and production deployments. This ensures consistent optimal performance of queries against SQL Server data.

### Scalable Reporting

For many organizations, getting the right information to the right people at the right time is a significant challenge. SQL Server 2008 provides a high-performance reporting engine for processing and formatting reports along with a complete set of tools for creating, managing, and viewing reports. An extensible architecture and open interfaces enable easy integration of reporting solutions in diverse IT environments.

You can generate reports from multiple diverse data sources, including SQL Server, DB2, and Oracle, without first building a centralized data warehouse. You can deliver reports throughout the organization both internally and externally through the simple deployment and configuration capabilities that are provided by Reporting Services. This enables users to easily create and share reports of any size or complexity. You can also deliver reports to customers and suppliers easily by deploying reports over the Internet.

Reporting Service provides support and the ability to control server behavior with memory management, infrastructure consolidation, and straightforward configuration through a centralized store and an API for all configuration settings.

### Extending the Reach of Your BI Solution

In the past, BI solutions were used by a small group of business analysts. Now, more and more organizations are realizing the benefits of extending the insights that are available through BI to all employees and embedding those insights into the day-to-day operations of the business.

SQL Server 2008 enables you to create a BI solution that can scale to thousands of users and deliver a rich user experience to everyone through an extensible, open, and embeddable architecture that is optimized for interoperability with Microsoft Office.

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## **Extending Business Insight to Everyone Through Familiar Tools**

Microsoft Office is a ubiquitous productivity suite that most information workers in organizations throughout the world use to perform their daily tasks. Through close integration with Office, SQL Server 2008 enables you to empower your employees with critical, timely business information that is tailored to their specific information needs.

Tight integration with the 2007 Microsoft Office System and PerformancePoint Server 2007 enables organizations to save time and money by using technology that works well together. The integration also provides a quicker return on investment in terms of end-user scale by delivering business insight to everyone through familiar tools that are already installed on every desktop computer.

### **Extend Your Reporting Solution with Microsoft Office**

Reporting Services 2008 supports rendering to both Excel and Word formats. Rendered reports are fully editable in the appropriate Office application, which extends your reporting solution so that users can create custom documents based on business reports.

### **Use Excel for Analysis**

Excel is the tool of choice for many financial and business analysis tasks. By combining Excel with SQL Server Analysis Services, you can bring the full power of your OLAP solution to business users through PivotTable dynamic views and Microsoft PivotChart® dynamic views in an Excel spreadsheet.

You can use the SQL Server Data Mining Add-Ins for Excel 2007 to enable business analysts and executives to go through the entire life cycle of a data mining project, including preparing data, building, evaluating, and managing mining models, and predicting results by using either spreadsheet data or external data that is accessible through your Analysis Services database.

### **Publish Business Insights Throughout the Enterprise**

SQL Server 2008 integrates tightly with SharePoint Services to make it easy to publish and manage reports centrally in a SharePoint site and to build user-specific dashboards that provide customizable views of relevant reports.

Additionally, PerformancePoint Server provides a central interface for data analysis that is built on SQL Server Analysis Services and enables customers to monitor, analyze, and plan their business, as well as drives alignment and provides actionable insight across the entire organization.

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## **Empowering End Users Through Flexible Reporting**

SQL Server 2008 provides a number of reporting enhancements that enable you to quickly and easily generate the reports that your organization needs, in the format that you want, and in a layout that makes sense of the data they contain.

### **Create Ad Hoc Reports with Report Builder**

Report Builder has been enhanced extensively in SQL Server 2008 to enable users to easily build ad hoc reports with any structure. The intuitive design interface makes it easy for non-developers to create business documents, such as purchase orders, invoices, and contracts, based on report data.

### **Include Richly Formatted Data**

Rich formatting can make business documents and reports more intuitive and significantly easier to understand. The rich text component of SQL Server 2008 enables mixed-formatting text boxes and importing of marked up text strings, and supports the new chart formats and the Tablix data region so that users can generate reports with high standards of visual design to convey business information clearly and logically.

### **Benefit from Increased Responsiveness**

As reports become more central to the way organizations distribute business information, ensuring the highest levels of performance and scalability of your reporting solution has become more critical. The Reporting Services engine in SQL Server 2008 has been significantly re-engineered to resolve current limitations, and now includes on-demand processing and instance-based rendering to provide the best possible reporting performance.

### **Deploy Reports Securely Over the Internet**

SQL Server 2008 enables you to extend the reach of your Reporting Services solution to external users, such as customers and suppliers, by publishing reports securely over the Internet.

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## Conclusion

SQL Server 2008 builds on the strong momentum in the business intelligence market by providing a scalable infrastructure that enables information technology to drive business intelligence throughout your organization and deliver intelligence where users want it. SQL Server 2008 makes great strides in data warehousing by providing a comprehensive and scalable platform that enables organizations to integrate data into the data warehouse faster and to scale and manage the data while delivering insight to all users. With the more scalable business intelligence infrastructure provided by SQL Server 2008, reports and analysis of any size or complexity can easily be managed, and at the same time empower users through the deeper integration with Microsoft Office. SQL Server 2008 also delivers improved performance in many areas, including data warehousing, reporting, and analytics.

### For more information:

Microsoft SQL Server on Microsoft.com

<http://www.microsoft.com/sql/>

SQL Server Development Center

<http://msdn2.microsoft.com/sqlserver>

SQL Server TechCenter

<http://technet.microsoft.com/sqlserver>

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