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Introduction

The collection of reporting tools available with SAP NetWeaver Business Intelligence (BI) 7.0 is referred to as the Enterprise Reporting, Query, and Analysis Information Technology (IT) scenario. The core tools found in the BI suite are referred to as the Business Explorer (BEx). These BEx tools provide business users with the ability to design, create, analyze, and distribute data that results in improved decision-making capabilities.

The BEx suite is illustrated in Figure 1. The BEx suite is closely integrated with the SAP NetWeaver Portal and the Visual Composer modeling tool. Learning how to use the tools found in the BEx suite gives users the ability to create a query, format a report, publish Web applications, and distribute information to other business users.

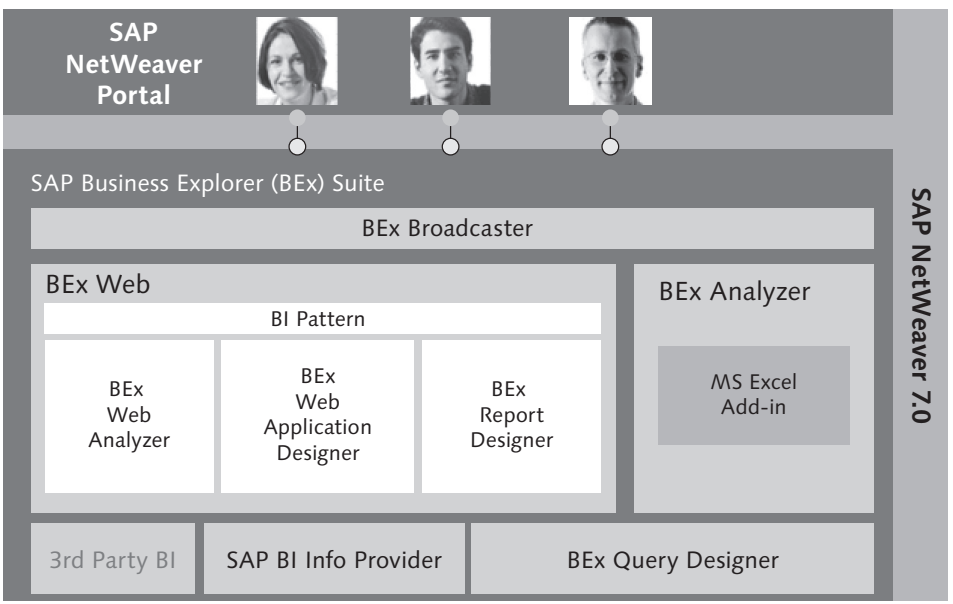

Figure 1 SAP BEx Suite

The BEx suite consists of the following tools:

- BEx Query Designer
- BEx Report Designer
- BEx Web Application Designer (WAD)
- BEx Web Analyzer (Web-based tool)
- BEx Analyzer (Excel-based tool)

Spanning across this toolset is the BEx Broadcaster, which provides options for scheduling and distributing report output to a printer, a Portable Document Format (PDF) file, or an email address. This book provides details on all of the BEx tools, including some advanced reporting features. It will also discuss the merger with Business Objects (BOBJ) and provide some direction on how to move forward as SAP BOBJ consolidates the BEx tools with the BOBJ portfolio.

The BEx Query Designer is the main tool for designing queries and generating data to analyze with an InfoProvider (i.e., InfoCube). The Query Designer lets a business user take advantage of Online Analytical Processing (OLAP) features such as variables, hierarchies, and custom formulas called calculated key figures. Defining exceptions or conditions and creating a customized matrix of rows and columns for a report is easily accomplished without any programming required. The Query Design tool is shown in Figure 2.

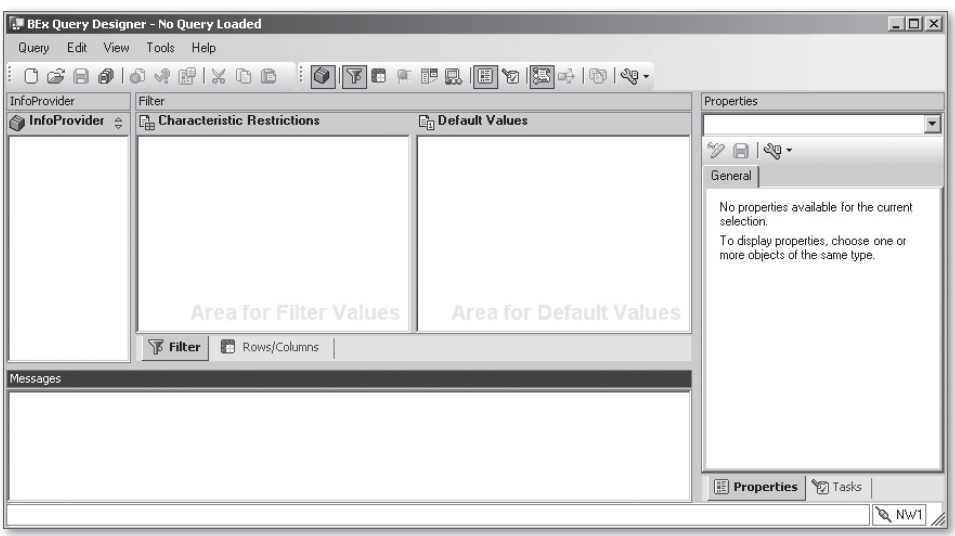

Figure 2 BEx Query Designer tool

The BEx Report Designer tool is a new as of BI 7.0. It has been added to the suite to fill the gap around formatted reporting. Earlier criticisms of SAP BW usually highlighted its inability to create presentation-quality reports. The Report Designer serves this purpose by taking the output from the Query Designer — a query definition — and transforming it by changing fonts, text, row/column heights, colors, etc. It also allows a designer to insert text, graphics, charts, headers, and footers. The result is a formatted report that is highly optimized for printing or for using in a presentation. A screenshot of the BEx Report Designer is shown in Figure 3.

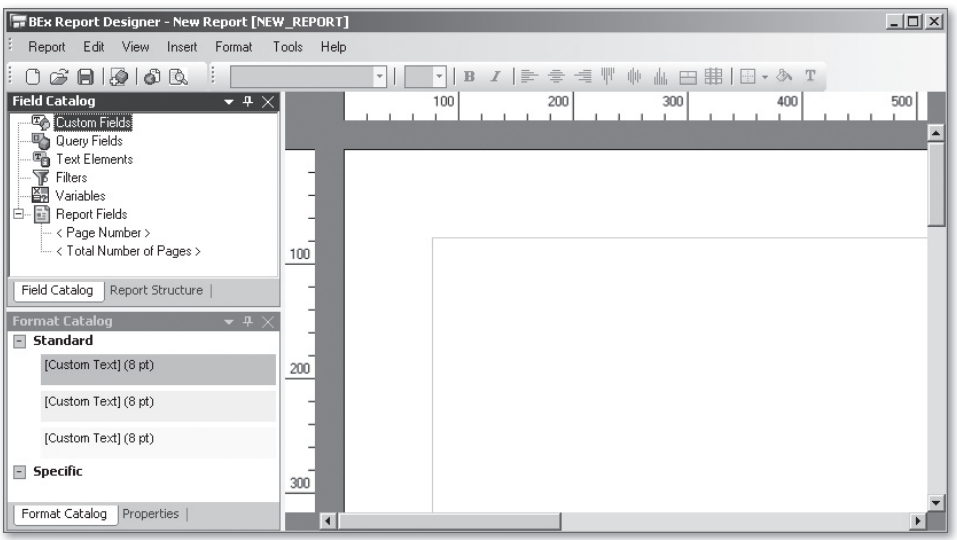

Figure 3 BEx Report Designer

The BEx WAD is another standalone tool that a report designer can use to build reporting applications that are optimized for the Web. A what-you-see-is-what-you-get (WYSIWYG) interface allows for the integration of basic word processing capabilities with BI-specific content. Web items delivered by SAP include buttons, filters, dropdown boxes, analysis grids, charts, and maps. All of these Web items represent placeholders that get assigned to a DataProvider. It is typically used by SAP power users to create interactive applications that are intuitive for end users to work with. Highly advanced dashboards can be constructed. If required, the underlying HTML code can also be modified or enhanced. The BEx WAD is depicted in Figure 4.

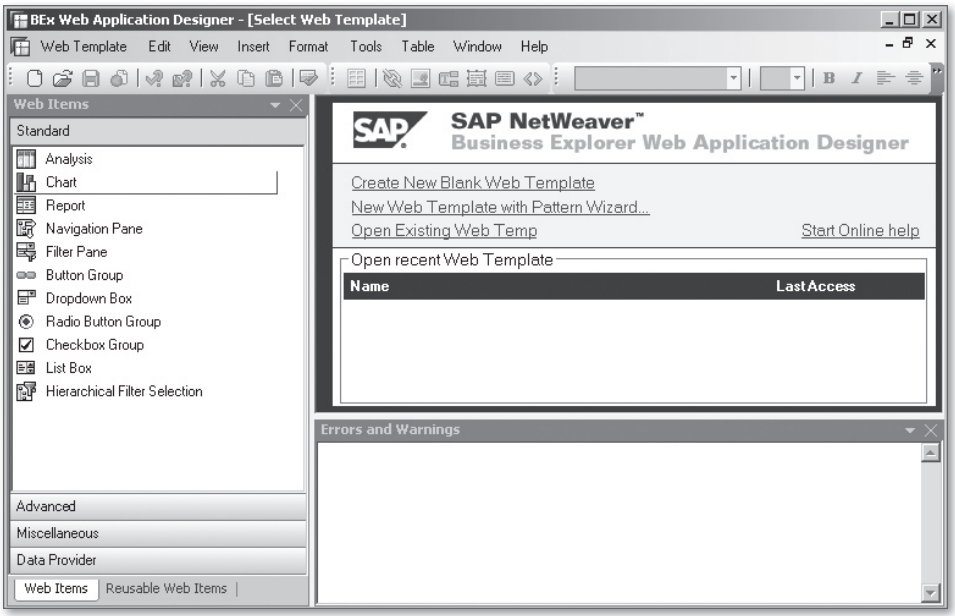

Figure 4 BEx WAD

The BEx Web Analyzer is an ad hoc analysis tool that is browser-based and provides zero footprints in terms of desktop application software because it requires no specific installation to use. The browser is linked to a specific SAP BI system and allows a user to drill down on a navigational state of a report and save this preferred view of the data for future use. OLAP functions, charting, broadcasting, exporting (to Excel or as a .csv file), and printing capabilities are all standard. A typical query executed in the BEx Web Analyzer is shown in Figure 5.

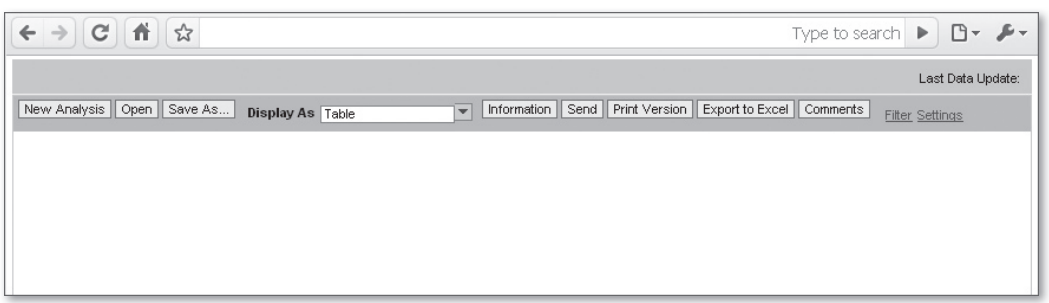

Figure 5 BEx Web Analyzer

The BEx Analyzer is integrated with Microsoft Excel and is accessible by installing the SAP Graphical User Interface (GUI) add-on for BI. Data is embedded into Microsoft Excel workbooks providing users with drag-and-drop capabilities to drill down and filter the data using SAP BI OLAP functions. Excel functions and features can be used to augment the analysis or to provide additional capabilities. Users can also leverage Visual Basic Applications (VBA) to create customized programs. As of BI 7.0, the BEx Analyzer comes with a second SAP BI–delivered toolbar that provides a rich set of design tools that allow for interactive applications to be constructed in a manner similar to that found in the SAP WAD. By using the new design mode a user can configure items such as dropdown boxes, checkboxes, and planning functions. Figure 6 is an illustration of a BEx workbook embedded in the BEx Analyzer.

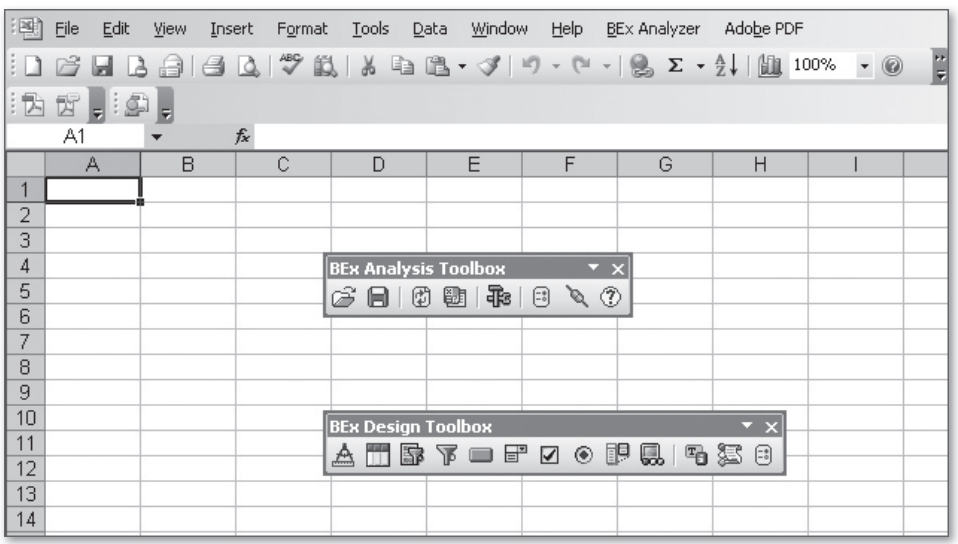

Figure 6 BEx Analyzer

The tools that make up the BEx suite provide solutions for enterprise reporting, ad hoc OLAP analysis, and dashboarding. The following chapters describe the BEx suite in detail and allow business users to stretch the value of their investment in SAP BI. Becoming an expert in BI Reporting can be achieved faster if you allow yourself to test the limitations of each tool. Experiment with each tool and try out every option. At the end of the day the worst thing a report designer can do is create a less than ideal report that can be cleaned up and enhanced over time. Be curious!

1 Fundamentals of Business Intelligence (BI) Reporting

It was once nearly impossible to extract information from applications. Corporate systems were disconnected, little historical information could be stored, and any data that was stored was often inaccessible. In addition, the information that was available lacked business process support. It is one thing to review data and quite another to link data to business processes that allow for exception reporting and alert notifications. These difficulties led to the concept of a *Data Warehouse* (DW).

1.1 Basics of Data Warehousing

Put simply, a DW serves as a decision support environment where corporate data can be quickly summarized at different operational levels.

Data warehousing is the process of choosing, migrating, cleaning, transforming, and storing data from disparate systems into one common location, whereby users can easily extract and analyze information for management decisions.

A DW is also commonly referred to as a:

- Data Mart
- Corporate Information Factory (CIF)
- Decision Support System (DSS)
- Business Intelligence (BI)
- Business Warehouse (BW)

One of the largest sources of data is an Enterprise Resource Planning (ERP) system. The process of migrating data from an ERP system to a DW is usually referred to as *Extraction, Transformation, and Loading* (ETL).

The multidimensional analysis offered by a DW, which enables DW users to analyze data trends, exceptions, and variances of interest, is called *Online Analytical Processing* (OLAP). Typical OLAP is used to answer questions such as:

- What was my best-selling product in January?
- What are my year-to-date Cost Center expenses?
- Why was I under my revenue target for March?
- Are we gaining or losing market share this month?
- How will my year-end look?

To compete, companies need to disseminate knowledge and information throughout their organization. To do that they have to contend with massive amounts of data that arrive from many different sources at various times. The ultimate goal of data warehousing is to manage this complexity and provide users with knowledge that gives them a competitive advantage and operational excellence.

The results of a successful data-warehousing initiative should include faster decision times, improved information quality, and greater strategic insight. With data warehousing, the data itself becomes a key asset to an organization, but only if decision makers can successfully access, understand, and leverage this new knowledge effectively.

Anyone in an organization that makes decisions needs BI; in other words, everybody. BI supports decisions at every level within an organization, whether the information is for an executive officer looking at Key Performance Indicators (KPIs) or for a finance manager to rationalize and monitor expenses by cost elements. The strategic nature of an executive dashboard and the tactical nature of a cost center analysis require data with the right level of detail and in the right context.

The concept of today's DW evolved from the concept of Management Information Systems (MIS) from IBM in the '60s and from a Harvard Business School article on Executive Information Systems (EIS) in the '70s. Data warehousing became prominent following the research and publications of Bill Inmon and Ralph Kimball. In 1958, Hans Peter Luhn defined BI systems in the *IBM Journal*. In the early 1990s, a Gartner analyst, Howard Dresner, popularized the term BI as a general term that describes using facts to improve decision making. Since then, BI and data warehousing have become a top spending priority for organizations and Chief Information Officers.

With numerous vendors in the data-warehousing space, BI tools have become standardized into familiar categories that are designed to report, analyze, and present data. These tools are generally categorized as:

- Spreadsheets
- Reporting and Querying
- OLAP
- Web Applications
- Dashboards
- Business Process Management (BPM)
- Data Mining

1.2 Basics of SAP BI

SAP BI is an end-to-end data-warehousing solution that is usually built on a three-tier environment consisting of Development (DEV), Test (Quality Assurance (QA)), and Production (PROD) servers. This three-tier configuration separates development work from a live system, and allows for sufficient testing with real data in the QA system. Enhancements are transported through a well-defined process that moves from DEV to QA for testing, and then to PROD, where BI users can access information. This landscape is depicted in Figure 1.1.

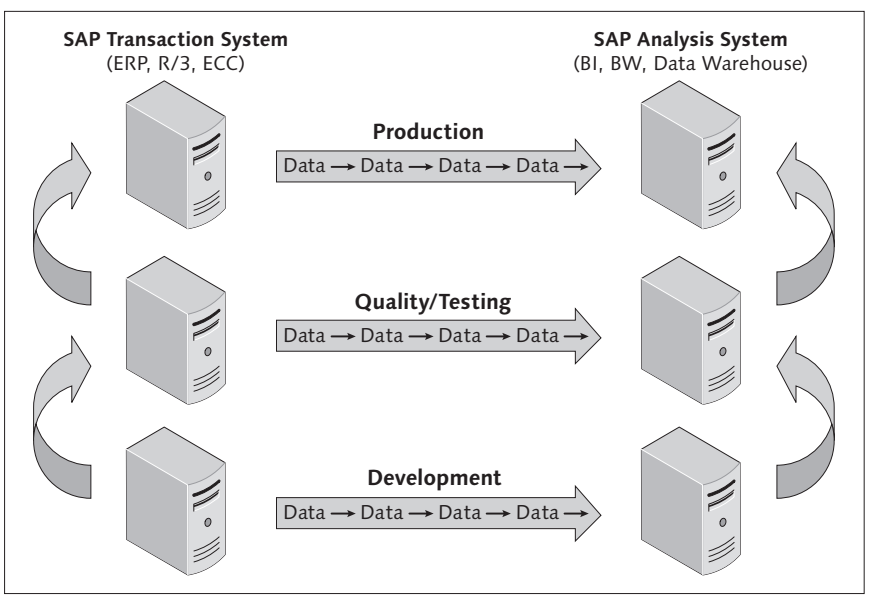

Figure 1.1 A Typical SAP ERP and SAP BI Landscape

SAP BI also has a three-tiered architecture. Figure 1.2 summarizes the architecture, which consists of the following layers:

- **Presentation layer**
  Consists of the SAP Business Explorer (BEx) tools such as BEx Analyzer and BEx Web Application Designer (WAD).
- **Database layer**
  Consists of InfoCubes, Data Store Objects (DSO), MultiCubes, and Master Data Objects that can be reported on. This layer also includes the Administrator Workbench and ETL capabilities.
- **Source Systems layer**
  Consists of SAP ERP Central Component (ECC) or ERP systems, legacy systems, text files, or another SAP BI environment that serves at a Data Mart.

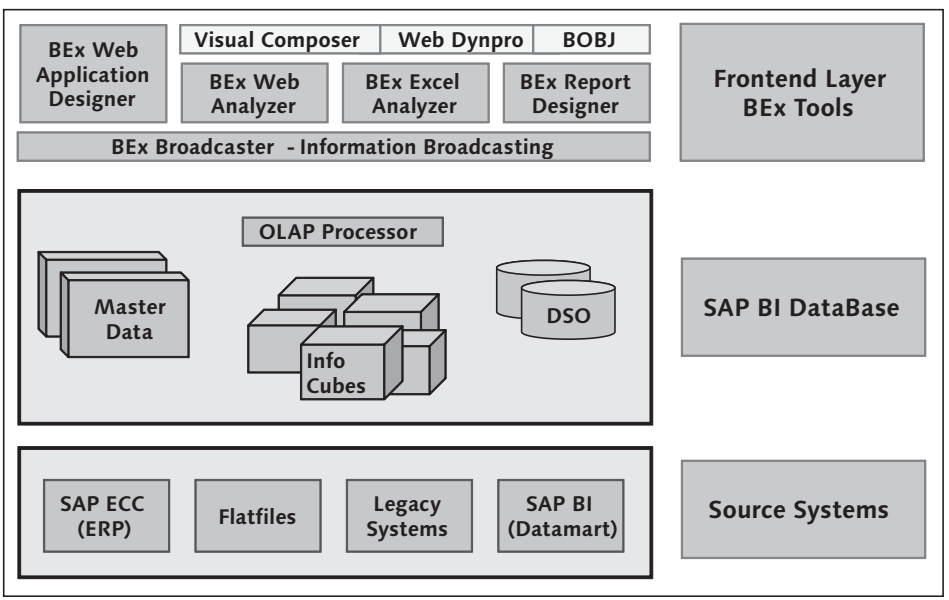

Figure 1.2 High-level BI Architecture

All SAP BI queries are constructed using the BEx tools, which request data from the BI database. The BI database follows an ETL process to populate InfoCubes, DSO, MultiCubes, and Master Data.

Objects for which queries can be created against or executed on using BEx tools are collectively referred to as *InfoProviders*. An *InfoCube*, which is a type of InfoPro-

vider, is a subset or collection of data from the BI database that has logical relationships that allow users to report on many things simultaneously. The InfoCube is based on SAP's extended star schema model.

Queries are designed and developed with the *BEx Query Designer*. A completed query is referred to as a *Data Provider*. You can display the output of a query definition as either a Web report using a standard web browser, such as Microsoft's Internet Explorer 7, or view a query result using the BEx Analyzer, which is integrated with Microsoft Excel.

Many queries can be built from a single InfoProvider. A single query definition has a one-to-one relationship with its InfoProvider. The query results from a query definition are displayed on a web page, or in the BEx Analyzer. You can format and store query results with many different views, which can result in a many-to-one relationship between a query definition and the formatted query results. Figure 1.3 displays these relationships.

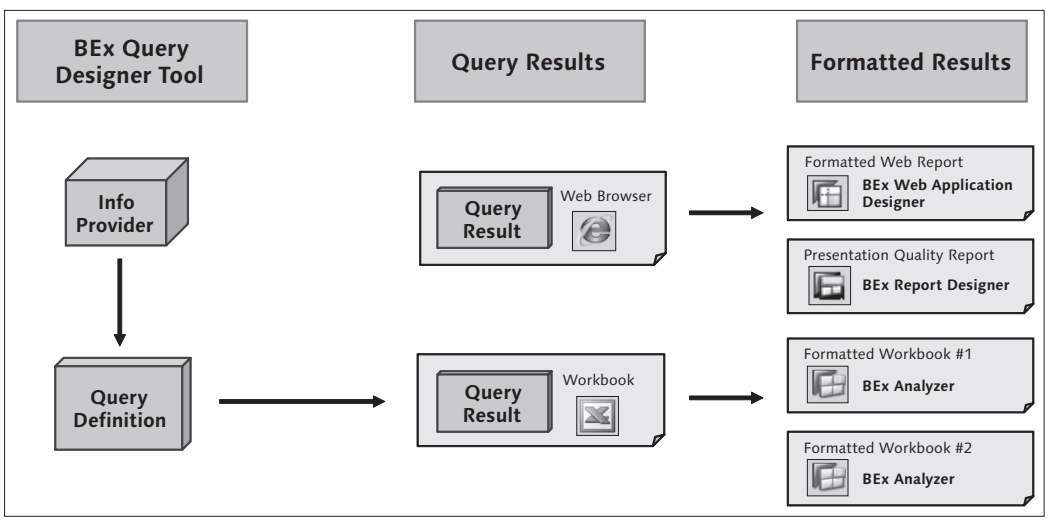

Figure 1.3 Relationship between InfoProvider, Query Definition, and Formatted Results

1.3 BEx Tools

The analytics architecture of SAP NetWeaver BI provides functionality for reporting, analysis, and planning of all business data. In general, the following scenarios are possible:

- A complete data-warehousing toolset that allows simple access, integration, and analysis of relational and analytical data from SAP and non-SAP data sources.
- The integration of analytical and planning capabilities into operational processes.
- A multienvironment platform that enables drill-down navigation and slice-and-dice analysis of data.
- The ability to distribute reports to information requesters.

SAP BEx reporting tools allow users to create, locate, execute, view, format, manage, schedule, and precalculate reports. Many of the BEx tools in SAP BI are installed on a client workstation using the SAP GUI and installing the BI add-on.

The primary BEx tools, shown in Figure 1.4, included with SAP NetWeaver 7.0 BI are:

- BEx Analyzer
- BEx Query Designer
- BEx Web Analyzer
- BEx WAD
- BEx Report Designer
- BEx Broadcaster and Information Broadcasting

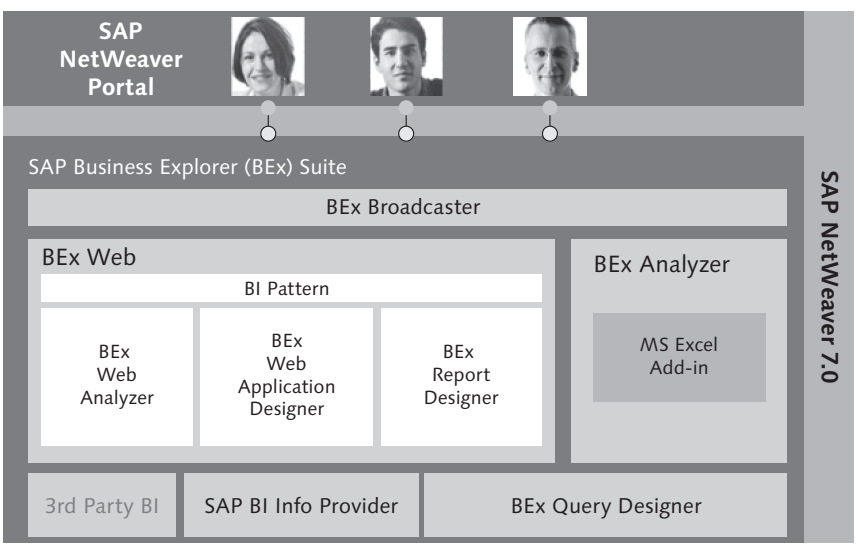

Figure 1.4 BEx Suite of Tools

Most organizations define user communities that result in certain tool access being assigned to each user community. At a minimum, this definition typically involves end users and power users. Depending on the particular scenario within an organization, the vast majority of end users will not have access to the design tools and will simply execute workbooks using the BEx Analyzer or view reports on a web page. The design tools would then be assigned only to power users. Design tools are the BEx Query Designer, BEx WAD, and the BEx Report Designer. By using SAP authorization concepts an administrator can assign standard security objects, which allow for the establishment of a predefined power user role and an end user role to limit access to tools based on the responsibilities of each user community. A proposal on how to split the roles and responsibilities between end users and power users can be found in Figure 1.5.

Role:	BI Power User	BI End User
Primary Responsibilities:	• Understand the underlying data in the SAP ERP system and the data in the BI system • Able to reconcile data across ERP and BI systems • Ability to create Ad-hoc queries • Provide first Level Support to End Users including report navigation training • Make recommendations for changes/ enhancements to queries and reports to IT • Distribute reports to End Users • Consults with IT when in need of assistance	• A report consumer • Ability to log in to the SAP BI system and successfully execute a desired report • Ability to interpret report results and make business decisions using the data • Distributes BI reports to non-SAP users • Consults with power users when in need of assistance
BI Tools Used:	• BEx Query Designer • BEx Analyzer and/or BEx Web Reporting • BEx Broadcaster	• BEx Analyzer and/or BEx Web Reporting

Figure 1.5 Definition of Power Users versus End Users

In addition to the standard BEx BI tools, the BEx Browser is a tool that was part of the BW 3.x toolset. This tool is no longer available with the SAP NetWeaver 7.0 BI tools; however, it is part of the SAP BI add-on installation that, by default, will install the BW 3.x tools along with the newer BI 7.0 tools.

The *BEx Browser* is a graphical desktop-like tool used to launch queries and workbooks and categorize them into roles, favorites, and folders. The BEx Browser also

incorporates standard shortcut functionality, which enables you to access documents, Windows applications, Internet URLs, and SAP R/3 transactions from a single interface. The BEx Browser allows users to create folders to organize their content. Figure 1.6 illustrates how BI content can be linked with other business tools in the BEx Browser.

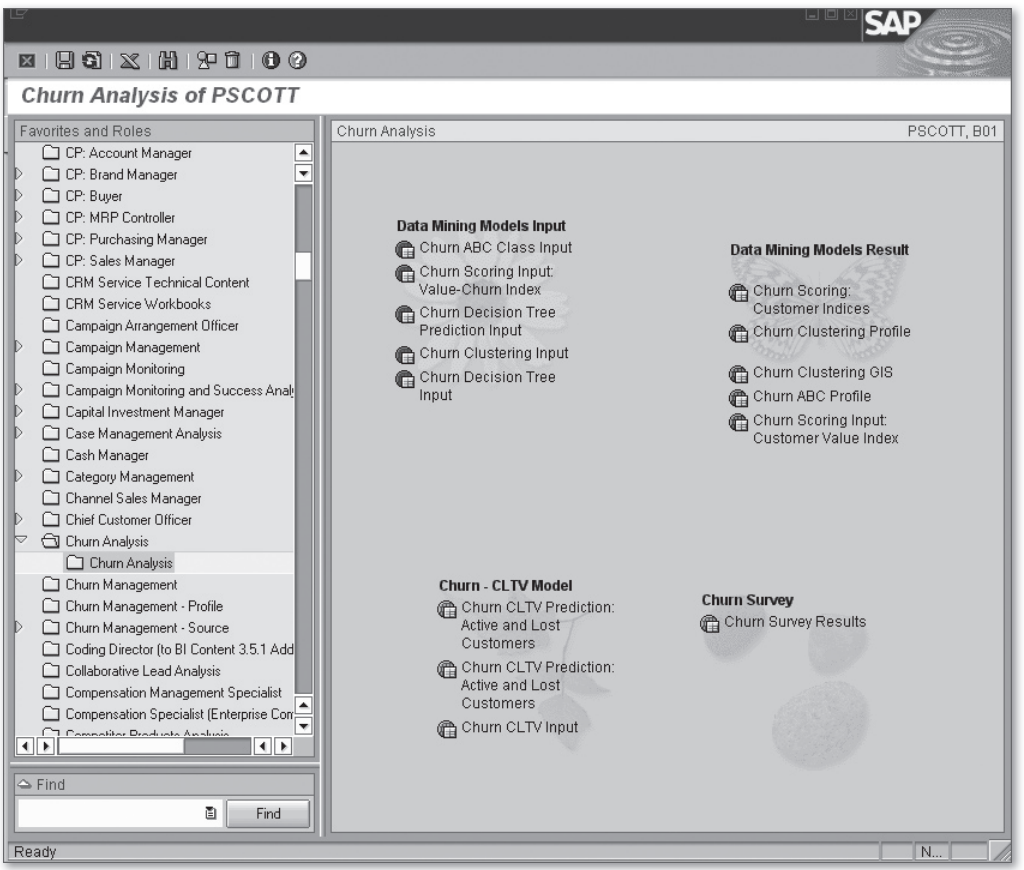

Figure 1.6 Linking BI Content with Other Business Tools in the BEx Browser

The BEx Browser toolbar (shown in Figure 1.7) contains the following icons:

- Exit
- Save
- Refresh
- Start Business Explorer Analyzer

- Find
- New Folder
- Delete
- About SAP BI Browser
- Help

Figure 1.7 BEx Browser Toolbar

You create content within the BEx Browser on the right side of the screen. Right-clicking on a blank part of the screen displays a context menu with several options. You can create the following links within a folder (Figure 1.8 displays the available options):

- Folder
- Workbook
- Internet Address (URL)
- SAP Transaction
- Document (Word, PowerPoint)
- Shortcut (to other applications on a local PC)

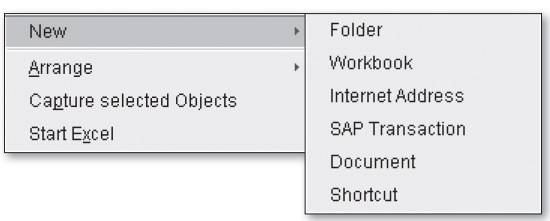

Figure 1.8 Adding New Content to a Folder

Each folder created for a role or user favorites can be further customized by assigning a background symbol and color, which are translucent. There are eight backgrounds and colors to choose from, each of which has a nature theme.

To customize folder options, right-click on a folder on the right side of the BEx Browser window and select Choose symbol and color. The graphical options are displayed in Figure 1.9.

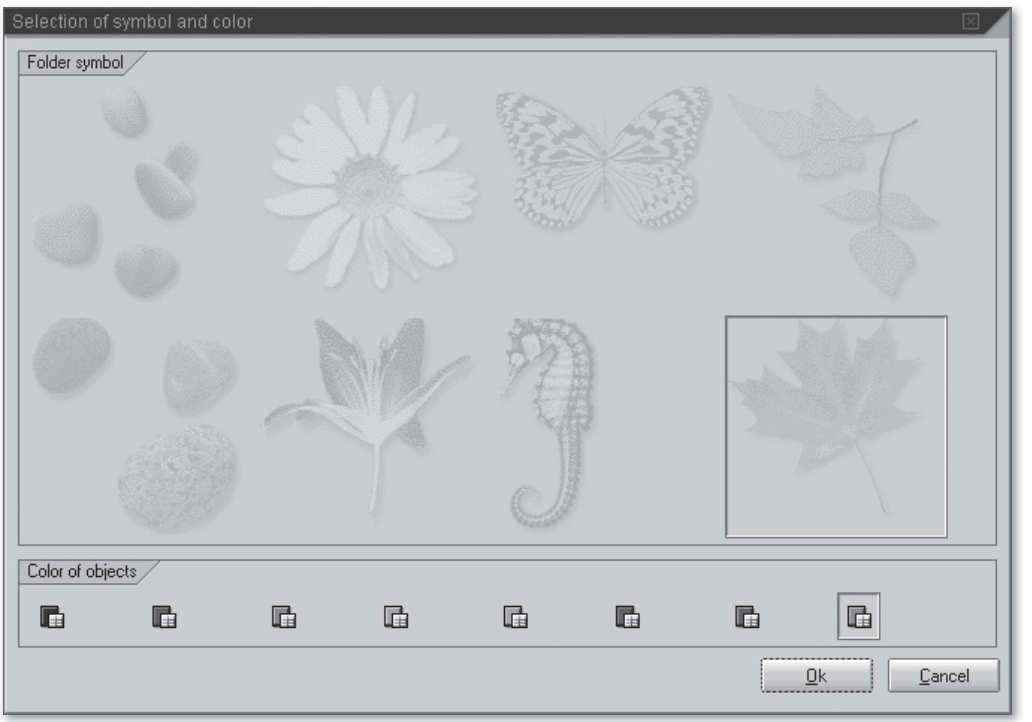

Figure 1.9 Folders Customized with Background Symbol and Color

The *BEx Analyzer* is the primary reporting environment for SAP BI. Most users find it very intuitive because it is integrated with Microsoft Excel. You can add Excel calculations, notes, charts, and graphics to a single worksheet and insert multiple reports into a workbook, thereby creating a package of reports. The BEx Analyzer combines the power of OLAP with all of Excel's functionality. You can also use *Visual Basic for Applications* (VBA).

As of BI 7.0 the BEx Analyzer is also a sophisticated design tool with planning input capabilities. The BEx Analyzer's functionality is divided into two different modes, each with its own toolbar (shown in Figure 1.10) and functions.

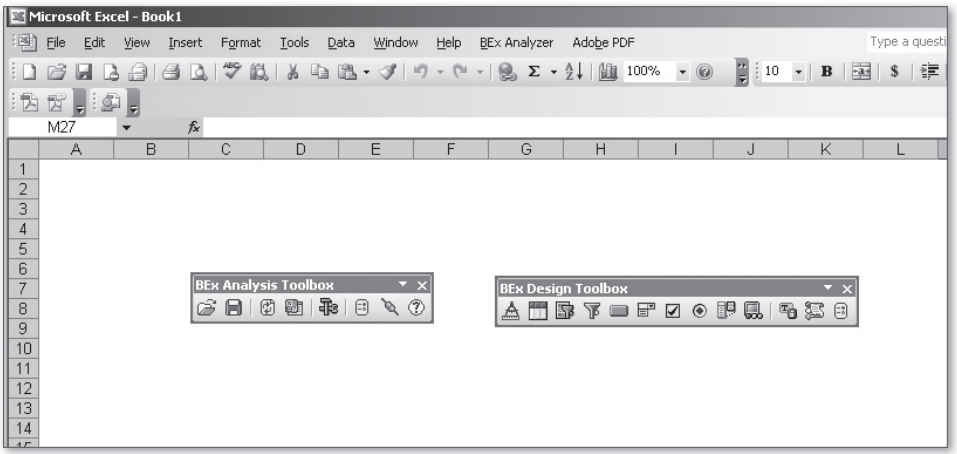

Figure 1.10 Analyzer Toolbars Found in SAP NetWeaver BI 7.0

The two modes are the Analysis mode and the Design mode. The BEx Analysis toolbar is used to perform OLAP analyses on query results in a workbook environment. Working in Analysis mode, you can navigate interactively on the data by filtering, drilling down, and sorting. Analysis mode also provides access to the planning functionality, the BEx Query Designer, and the BEx Broadcaster. A summary of the BEx Analysis toolbar is shown in Figure 1.11.

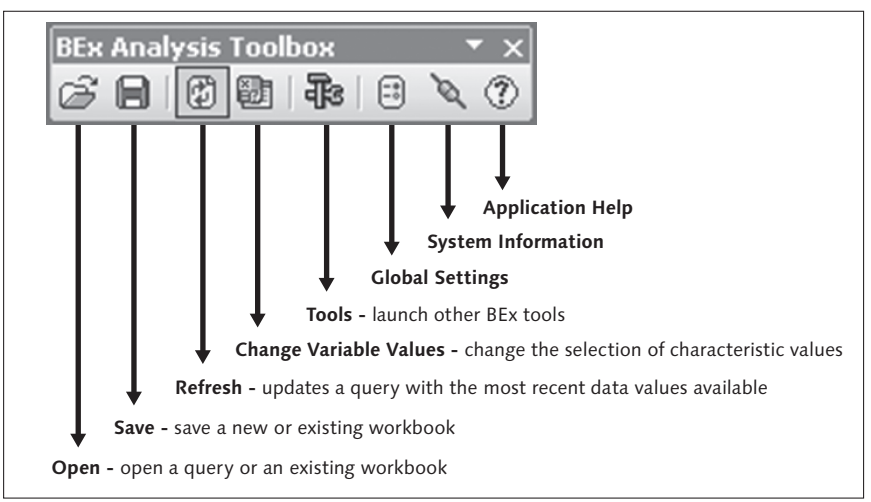

Figure 1.11 BEx Analyzer—Analysis Toolbar

The BEx Design toolbar is used to create custom templates and interfaces for query applications within the workbook. Working in design mode allows a user to insert BI design items, such as analysis grids, dropdown boxes, radio button groups, checkboxes, and a filter blocks. Microsoft Excel functionality can also be used to insert titles, images, formulas, and text to enrich the presentation of the template. Figure 1.12 highlights the available design items. Design mode is toggled on and off using the BEx Design toolbar.

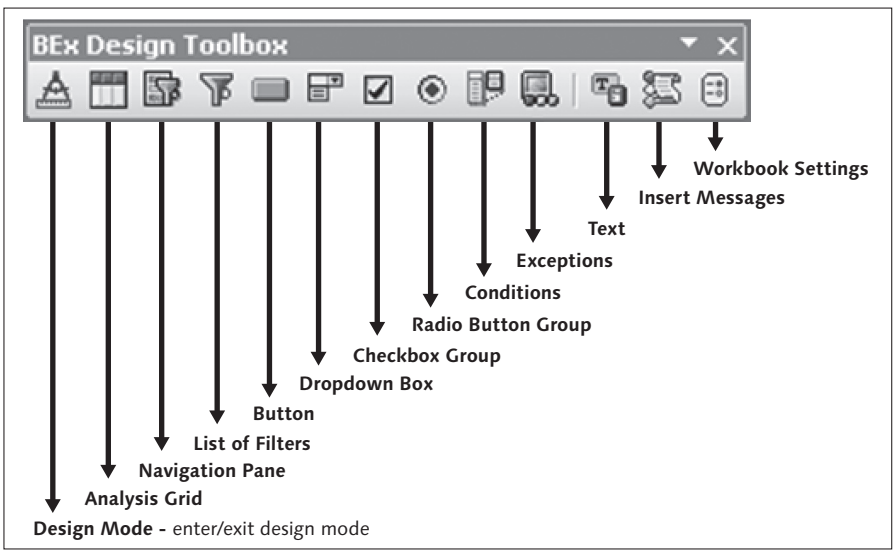

Figure 1.12 BEx Analyzer—Design Toolbar

By default, the BEx Analyzer provides a standard design template that is leveraged every time query results are embedded into a workbook. This default template consists of an analysis grid, filter block, information button, and a chart button that toggles the data between a graphical representation and a table view. The default template, which appears in Figure 1.13, also displays the author of the query, by user ID, and displays the status of the data—which is the date and time of the last ETL process that brought data records into the InfoProvider, which feeds the query results.

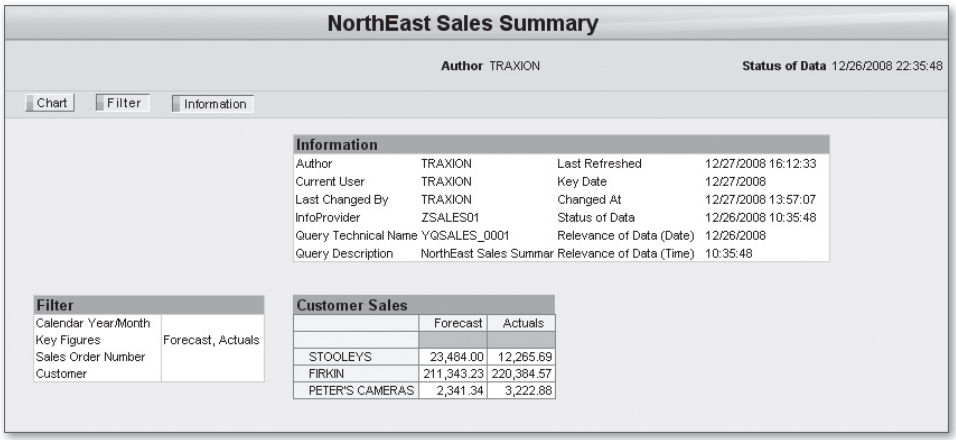

Figure 1.13 Standard Layout for a BEx Analyzer Workbook

The *BEx Query Designer* is a standalone application that enables users to build complex query definitions without using programming. All subsequent BI reporting and analysis is based on query definitions. The BEx Query Designer is displayed in Figure 1.14.

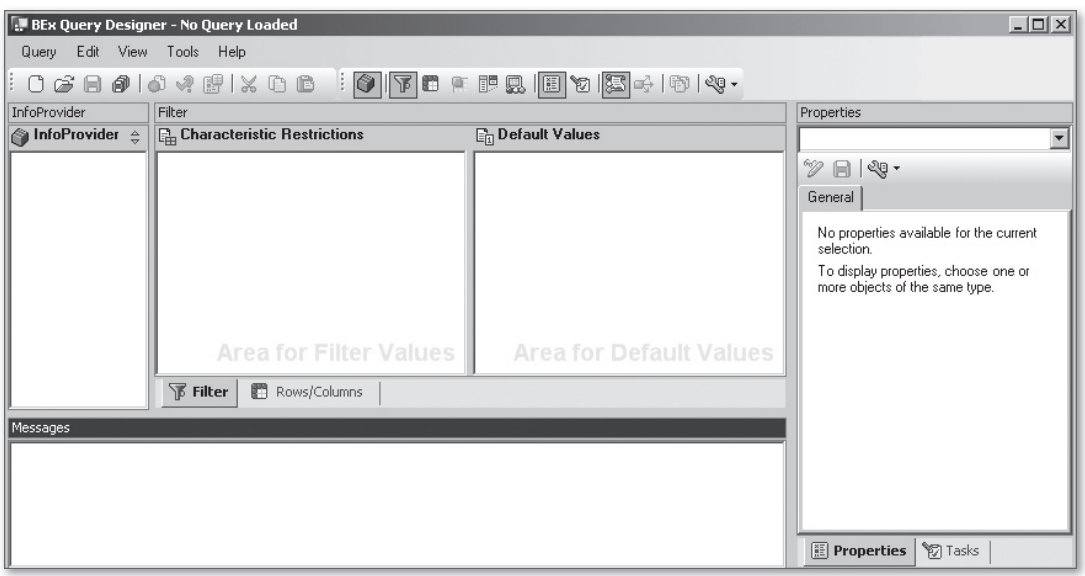

Figure 1.14 Create a Complex Query Definition without Programming

The BEx Query Designer can be launched from the BEx folder—typically found under the Start menu of a Windows-based system. It may also be accessed from the BEx Analyzer or the BEx WAD. A query definition that is created and saved using the Query Designer can be viewed using the BEx Analyzer or it can be viewed using the *BEx Web Analyzer*—also referred to as Web reporting. The BEx Web Analyzer provides a standalone Web application for data analysis that is called by entering or copying a Web address or URL into a browser. In addition, the Web Analyzer can be used to save data views generated from the navigation and analysis of a standard query layout. These query views allow users to return to a preferred navigational state in the future and view results using this view. OLAP functionality is available in both the BEx Analyzer and Web report. The BEx Analyzer requires software installation on a user's PC while the Web report has the advantage of being "zero footprint"—it requires no additional software except a standard web browser. The standard Web-reporting interface is shown in Figure 1.15.

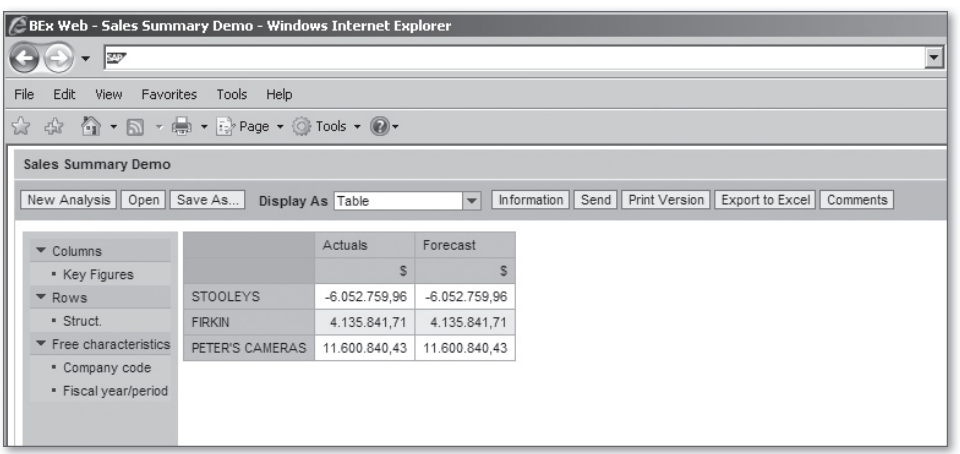

Figure 1.15 Standard Layout for a Web Report

The *BEx WAD* is a desktop application that is very similar to other web page authoring tools. The BEx WAD, Microsoft FrontPage, and Adobe Dreamweaver are alike in that they all enable you to use a what-you-see-is-what-you-get (WYSIWYG) environment when creating a web page. One unique feature of the WAD, depicted in Figure 1.16, is that it enables a designer to incorporate BI data and predefined BI objects, along with standard HTML code and Web design application programming interfaces (APIs). These BI-specific objects retrieve BI data from an SAP BI data provider and place it on the web page. These objects are referred to as Web items. Some of the available Web items included with the WAD are:

- Charts
- Navigation Pane
- Filter Pane
- Dropdown Box
- Checkbox Group
- Tab Pages
- Maps
- Menu Bar
- Information Fields
- List of Exceptions
- List of Conditions
- Ticker

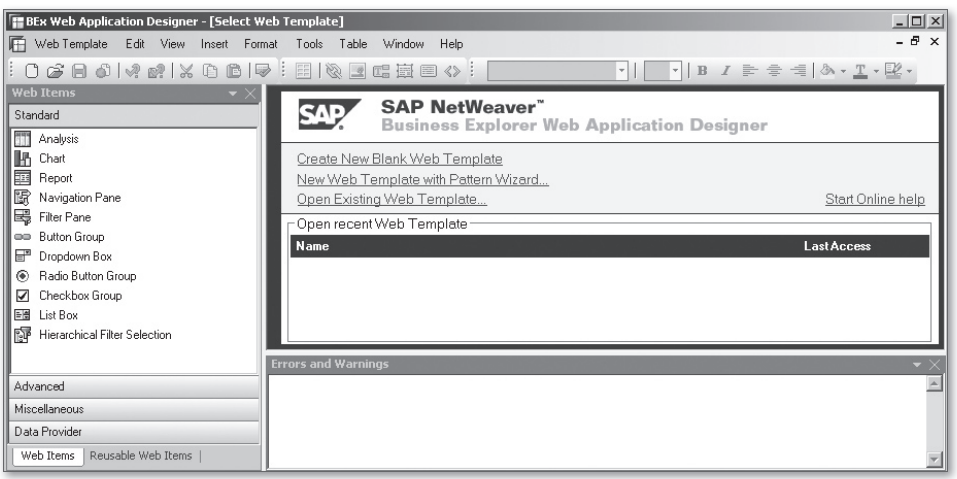

Figure 1.16 The WYSIWYG Interface of the WAD

The *BEx Report Designer is a* graphical tool for creating highly formatted static reports typically optimized for presentation or printing. It is a standalone desktop application that is launched from the BEx folder. The formatted report can be displayed on the Web or converted into a PDF document to be printed or distributed. It is typically used for common financial statements such as balance sheets and income statements. Note: To create a formatted report there must be a structure used in the Columns section of the query for which the report is sourced from.

The Report Designer, shown in Figure 1.17, is a new tool that shipped with SAP NetWeaver BI 7.0 and has some basic functionality that quickly allows a designer to build a report optimized for presentation.

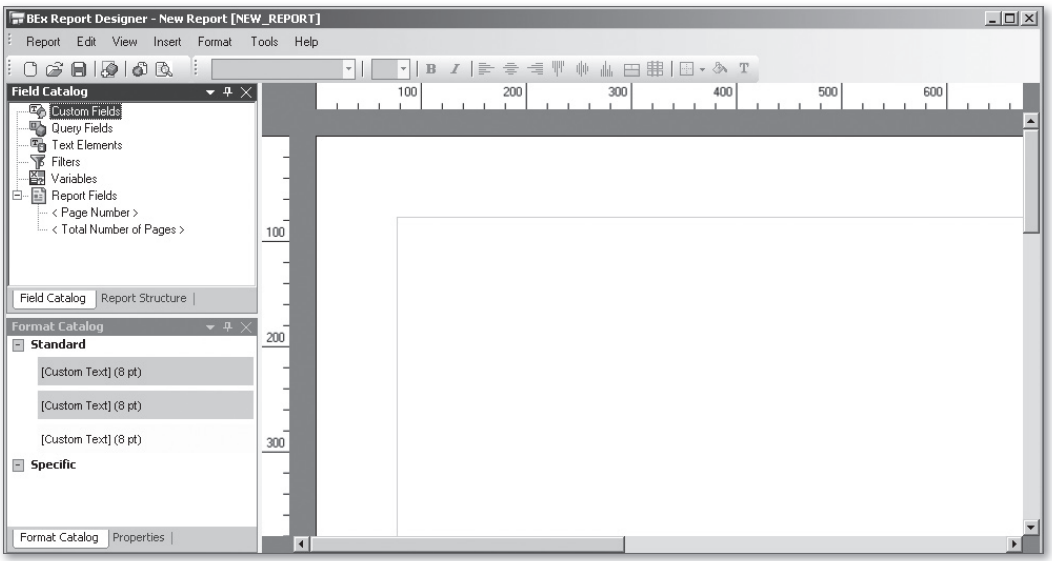

Figure 1.17 The BEx Report Designer Tool

Some of the BEx Report Designer functions include:

- Inserting rows and columns
- Adjusting the height and width of rows and columns
- Dragging and dropping the position of individual fields
- Adding text and text headings
- Inserting report or page headers and footers
- Basic formatting functions such as font, font size, font enhancements (bold, italic, etc.), font colors, and background colors
- Inserting pictures, images, and charts
- Formatting row, cell, and column borders
- Merging cells

The *BEx Broadcaster* is used to precalculate and distribute reports, queries, Web templates, query views, and workbooks. The precalculated results can be prepared as

a document or as a Web URL that can be accessed as a link. The advantage here is that precalculating shortens the wait time for users and reduces the workload on the servers during peak hours. The distribution options allow broadcasting to email(s), portals, or precalculated reports to be sent to a printer. With NetWeaver BI 7.0 the broadcasting capabilities are typically configured using the Broadcasting Wizard. The Wizard provides an assisted set of predefined steps that support a user creating a new broadcast setting. It is possible to broadcast by email or to a Portal at a recurring time/date specified by the user or by a trigger, such as when data is updated in the InfoProvider. Certain authorizations are required to create and schedule background jobs. This access is usually only given to a limited number of users, who can then configure broadcast settings that propagate to a department or set of information consumers.

The BEx Broadcaster can be launched from many of the other primary BEx publishing tools. Regardless of the launch point, the same series of steps are followed to create a new broadcast setting.

You can call the BEx Broadcaster using the toolbars from the:

- BEx Query Designer: Query • Publish • BEx Broadcaster
- BEx Analyzer Analysis toolbar: Tools • Broadcaster
- BEx Report Designer: Report • Publish • BEx Broadcaster
- BEx WAD • Publish • BEx Broadcaster

Tip

The Broadcast option only appears in the BEx Analyzer when a workbook has been opened. It is also possible to launch the BEx Broadcaster from a Web report by right-clicking on the context menu over the results area and following the Broadcast and Export menu.

The overall workflow for using all of the various BEx tools is shown in Figure 1.18. The most basic reporting is accomplished by using the BEx Query Designer and the BEx Analyzer. An alternative or complementary reporting strategy to just using the BEx Analyzer is to use Web-based reporting. With Web reporting, you don't have to install any software on a user's PC, which is why this alternative is known as a zero-footprint solution. Query designers can publish formatted, graphical reports using the BEx WAD and distribute these reports via URLs or a preexisting intranet portal. High-end formatting can be achieved by leveraging the Reporting Agent, Download Scheduler, or via integration with Crystal Reports.

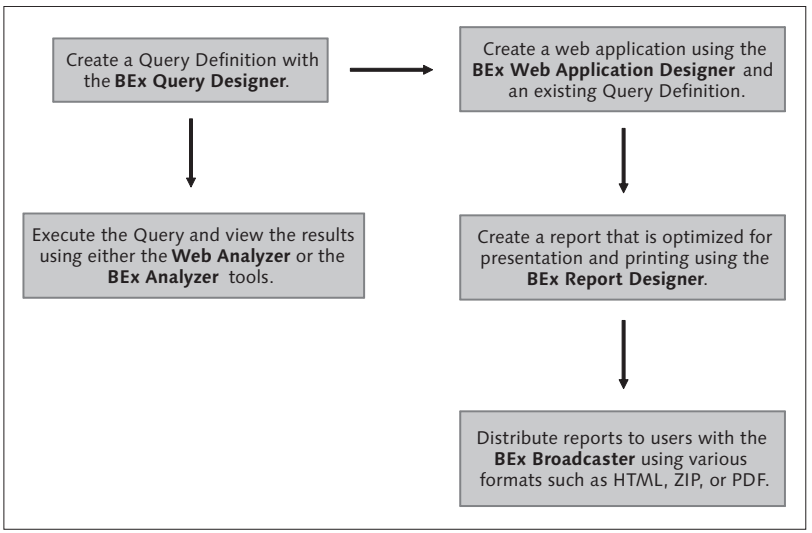

Figure 1.18 BEx Tools Workflow

1.4 Summary

SAP BI has evolved into a full-fledged DW. The suite of BEx tools allow users with diverse backgrounds to effectively access and analyze data in a timely fashion. Queries are defined using the BEx Query Designer and analyzed within the BEx Analyzer or within a BEx Web Application. Additional formatting can be achieved with the BEx Report Designer or by leveraging the new Design toolbar found in the BEx Analyzer. Highly interactive dashboards and Web applications can be developed using the BEx WAD. Charting and graphics features in the WAD allow for quick processing of complex sets of data. The BEx Broadcaster offers the ability to distribute a variety of objects with BI content to a spectrum of users according to individual requirements. Each BEx tool has a primary function and deliverable that is then integrated with and passed along to other BEx tools for further development. This book focuses on the step-by-step processes of creating a query, viewing results, formatting reports, and coordinating the distribution of knowledge and information. The next chapter will look at the BEx Query Designer in detail.

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