SAP Business Intelligence Overview

Before we delve into the details of the functionality of NetWeaver 2004S (7.0) BI reporting, we need to review some of the architecture and concepts of the SAP systems that support these analysis tools. This chapter explores the overall architecture and structure of the SAP NetWeaver System and then goes into further detail concerning the BI architecture and options. In this way, you will be able to position the details of BI 7.0 report functionality within the larger picture of the new NetWeaver platform. We will start with an analysis of the different areas and elements of NetWeaver, of which BI is a part, so as to understand the integration between all the different components. Then we’ll take a more detailed view of the data-flow process within the BI system to understand what more there is in support of the reporting functionality.

One of the challenges of current business processes is that they are made up of multiple, different systems, all trying to talk to each other in various languages, different platforms, and different landscapes. Companies want to reduce their costs, find new ways of increasing turnover and profitability, and be able to flexibly adjust to all types of changes. In this context, the question of how to adjust or integrate existing applications and flexibly implement new applications plays a central role. Existing investments should be used optimally, and at the same time new business processes have to be supported quicker and in a more intelligent way. These days, realistic system landscapes often consist of many systems. This situation may have grown out of a specific corporate strategy of going with best of breed, or perhaps with numerous mergers and acquisitions, the system landscape has just grown out of control. The business processes that are to be mapped in these complex system landscapes contain process steps that run over multiple, different systems. For all system transitions, sending systems are connected to receiving systems by means of interfaces (point-to-point connections). Different interfaces are often implemented using the technology that is considered to be ideal for the respective interface. Due to this, administrators not only have to take care of complex system environments, but must also know many different system technologies.

In Figure 1-1, every interface is represented by a connected line. This illustrates the complexity of an integration solution.
Challenges of the Current IT Landscapes

After a merger, the existing company will have a very heterogeneous IT infrastructure. To map processes, not only SAP systems and functionality are used but also software components from other providers as well as business applications that have been developed internally. The business processes are then extended over the multiple system landscapes. The ability to map these business processes as effectively as possible is a complex and time-consuming activity for the parent corporation. Even the basic processes of Order-to-Cash and Pay-to-Procure are difficult to analyze due to the inconsistency of the mapping process. In addition to the actual implementation of this scenario, the company is faced with the overall cost of maintenance, the integration of different types and formats of master data, the need for uniform reporting across the processes and across the companies, and the task of making sure all parties are getting the information they need to complete their tasks.

Studies on how long it takes to change existing business processes or introduce new processes still show that it takes quite a bit of time, ranging from months to years, depending on the process. The people surveyed attribute about a third of this to the inflexibility of IT, another third attributed to concerns around the corporate culture and the final third is attributed to the concerns with change. With SAP NetWeaver, the process of implementing and adjusting complex business scenarios is much quicker, easier, and more flexible. For example, SAP NetWeaver reduces the complexity of system landscapes by

- Being a single platform for integrated information and systems.
- Providing functions that make time-consuming, expensive integration projects unnecessary.
- Ensuring compatibility with .NET and WebSphere objects.
- Making it possible to increase the flexibility of business processes with the new Enterprise Services Architecture concept.
In Figure 1-2, you can see that rather than having to integrate with each different system separately and then attempt to consolidate these activities, you are integrating with a single point of communication and then consolidating these activities and processes through a single platform. It is possible to work with the SAP NetWeaver system in terms of a number of modules that can also be implemented separately. The most important thing, though, is that the whole is more than the sum of the individual components. SAP NetWeaver enables you to flexibly develop business processes on tailored components without having to give up existing investments.

**SAP NetWeaver: Overview of Components**

SAP NetWeaver is the technical foundation on which almost all mySAP solutions are currently based. SAP NetWeaver is the functionally enhanced successor of the SAP application platform mySAP Technology, and it serves as the basis for the Enterprise Services Architecture in order to meet requests for flexibility and integration among systems, interfaces, users, and processes. It connects information, business processes, and people across systems and organizational boundaries. It is the central tool for reducing the total cost of ownership (TCO) of complex system infrastructures.

As you can see in Figure 1-3, the SAP NetWeaver platform has four integration levels. It provides the core functions for the technical infrastructure of business solutions. These integration levels are People Integration, Information Integration, and Process Integration, and Application Platform. SAP NetWeaver also supports cross-application software, so-called composite applications or xApps (xApps connect heterogeneous systems in continuous cross-function processes so that the underlying applications can be more or less ignored). In addition, different software interfaces ensure full interoperability of applications that are running on Microsoft .NET and IBM WebSphere.
People Integration: The Use of an Enterprise Portal

An enterprise portal is the gateway to the end user. Based on the end-user view, this section illustrates how a user-friendly interface makes it possible to access relevant data from very different systems. In addition, it illustrates the meaning of role-based user and content management and shows that using business packages can significantly reduce the amount of resources required for implementing a portal.

An enterprise portal offers a central point of access to information, applications, and services in your enterprise. All SAP and non-SAP systems, data warehouses, desktop documents, as well as web content and web services are brought together on one uniform interface. By using single sign-on, users benefit from the convenient authentication and communication between IT systems. Knowledge management in the portal turns unstructured data into important information for the enterprise and the regional business users, collaboration facilitates the communication among people across enterprise borders, and personalization adapts the structure to the requirements of individual users.

Figure 1-4 shows an overview of the architecture of the SAP Enterprise Portal. Basically speaking, a well-defined Enterprise Portal can offer the business users the right information and the right functions at the right time from any location and in the right format. To do this, SAP Enterprise Portal provides an infrastructure you can use to retrieve and edit data from information sources in your company as well as from the Internet by means of iViews. SAP provides iView templates to help facilitate the implementation of the portal, but you can also create customer-specific iViews. The SAP Enterprise Portal also provides powerful search functions with which you can selectively and intuitively retrieve files and documents from different sources of information, such as local database applications, websites, or pools of enterprise documents. Collaboration functions allow you to use common resources and content. The individual tools and services include virtual project rooms and tools for real-time interaction, regardless of geographical distance. You can use discussion forums to exchange data and information with colleagues whose workplace is not in the same area or even in the same time zone. The core functions of SAP Enterprise Portal are written in Java; therefore, you need a J2EE runtime environment, which is provided by the SAP Web
Chapter 1: SAP Business Intelligence Overview

Application Java Server. SAP Enterprise Portal uses an open architecture. The standards it supports include SOAP (Simple Object Access Protocol), UDDI (Universal Description Discovery and Integration), and XML (Extensible Markup Language). The portal has powerful security functions, including extensive support of directory services, digital certificates, and the SSL protocol. It is also highly scalable and designed to be used by any number of business users, from small groups to large departments. It also supports mobile devices.

Roles in the SAP Enterprise Portal
Roles determine which navigation paths, specified using the file structures, can be used to access which content, specified using the integrated iViews and pages. Roles can be assigned to individual users or groups of users.

Note: The term content covers all types of content available to a user in their role-based portal view. A Content object can be an iView (a program that determines data from different sources of the enterprise or Internet, displays it in the SAP Enterprise Portal, and, if applicable, makes it available for processing), a page (a layout of one or more iViews), or a workset (a collection of tasks, services, and information that can be used to create roles). Worksets consist of iViews and pages, arranged in a folder structure that determines the navigation paths.
Either the portal is used as the users’ central workplace, with access to different applications, or it serves as the user interface within a specific application. This is the situation in SAP Master Data Management (SAP MDM) as well as in xApp SAP xRPM for multiproject management of the employee or manager self-service work center. The roles for administering users and content are generally separated. Administrators of users and roles define both objects according to the enterprise requirements in the system and then assign roles to users. Content administrators define which content is available in the system, ensure that it is administered properly, and decide which roles can work with which content.

Figure 1-5 shows an example of the SAP Enterprise Portal. As you can see, the portal is divided into sections with the business user requirements in mind. This can all be customized for the correct look and feel for the customer. The information displayed can be from multiple sources and systems or from one specific system. The functionality of the SAP Enterprise Portal adapts to the needs of the business user.

**Business Packages**

In addition to approximately 100 standard business content roles, SAP delivers Business Packages. Business Packages contain predefined portal content that can be used to call up transactions and reports from all sorts of systems. In addition, they contain documents and information based on the roles for managers, casual users, and analysts. Business Packages facilitate the work of your content managers and significantly reduce the implementation time of your enterprise portal because they enable portals to be created without additional development work. So, while others are working to program their enterprise portal platform, you already set up and are taking advantage of using the SAP Enterprise Portal.
In Figure 1-6, you can see the specific target groups identified based on Business Packages. Business Packages are classified according to target groups that consist of end users, specialists, and managers. Business Packages for end users contain the tasks that a portal user may carry out in the portal, regardless of their other roles in the enterprise. The tasks help beginners familiarize themselves with the portal as quickly as possible and thus increase the acceptance of the enterprise portal. The content includes functions such as e-mail, task lists, calendar administration, travel expense settlement, administration of benefits, employee self service, e-learning activities, and additional search functionality for the employee directory. Business Packages for managers or decision makers can use the content for efficient analysis and for gaining decision-relevant information. They offer extensive tools for planning and administering the portal and its budget. Line managers, team managers, and project managers can reduce the time they have to spend on administrative tasks and focus on strategic tasks. The most widespread Business Packages for managers include the Manager Self-Service (MSS). The final Business Packages are for specialists, which are aimed at the experts from different departments in the enterprise, such as Sales, Human Resources, Marketing, Finance, and Production. They provide appropriate analysis tools, which enable users to act quickly based on the right information. These packages can also provide operational tools, such as campaign management for marketing employees. You can purchase Business Packages from the iView Studio, a central marketplace for portal content. As a registered user, you will find the individual packages at www.sdn.sap.com. You can display and review them, and then download the content required.

**SAP Mobile Infrastructure**

SAP Mobile Infrastructure (SAP MI) is a technology solution of SAP NetWeaver, which is the basis for the SAP solutions for Mobile Business. This is usually an enhancement to an existing SAP application, as shown in Figure 1-7.

For example, an enhancement for SAP Human Resources can be used to enter travel data and working times on the go. In the same way, service employees can be directly informed of new orders via a mobile device, and they can confirm data directly with the
customers instead of writing down data on sheets of paper and entering it into the backend system later on. Mobile business increases flexibility as well as makes it easier to provide information to field sales representatives. A sales employee can dynamically access customer and order data without having to download and save it from the back end before visiting a customer. This also leads to getting rid of piles of paper, where data has to be reentered into the IT systems afterward. This speeds up processes, reduces the amount of work required for field sales representatives, and is less error-prone because the data is entered when it is created. SAP MI can also be used to mobilize non-SAP-based applications. SAP MI can be locally installed on a mobile device and is equipped with a web server, database layer, and dedicated business logic. Therefore, remotely working employees never have to wait for a network connection to complete time-critical business transactions but can instead work offline. To synchronize the data on a mobile device with the back end, SAP MI provides tools for synchronization and data replication. SAP MI is equipped with a Java Virtual Machine and provides an open programming model with which developers can create mobile applications. This open-system architecture facilitates platform independence of mobile devices and networks as well as supports mobile devices such as personal digital assistants (PDAs), laptops, and smart phones.
Information Integration

Each solution supplied by SAP offers reporting options via the data of the respective application. Usually, the application provides a large number of standard reports for this purpose, but user-defined reporting is also possible. Customers can use the query interface to program their own reports in the ABAP workbench and then read the data of the production system as needed. This type of reporting can also be used with SAP NetWeaver. At this time, more than 8,000 customers are successfully using the software solution SAP Business Intelligence (system component SAP BW), either in parallel to the ABAP workbench process or exclusively. One reason for this is the increasing requirements for integrated solutions for the enterprise-wide analysis of data. In times of globalization and market expansion, it is important to have access to the relevant information from one’s own enterprise at any time and to be able to analyze it flexibly, including in aggregated form and without placing a performance strain on the transactional system. In heterogeneous system infrastructures, the extraction and preparation of consolidated transaction and master data from SAP systems and source systems by other suppliers are particularly challenging. Apart from integrated data procurement, options for detailed data analysis and the multimedia display of the analysis results are required to meet the increasing quality requirements for enterprise information.

We will be looking at this in more detail (at the 30,000-foot level rather than the 50,000-foot level) in the next section of this chapter. Therefore, this discussion introduces the information for the following section. However, it’s obvious that you need to understand the transaction-oriented OLTP and the integration with the analysis-oriented OLAP environment (online analytical processing). As Figure 1-8 shows, the uses of each type of data are specific to the level of granularity.

In the current business environment, huge amounts of information are created from the data for business processes that is not easily used for practical analysis. Therefore, the data is cleansed and, due to its different origins, technically and semantically formatted (homogenized). The result can be used to generate knowledge that’s helpful to the enterprise management to define its enterprise strategy and the business processes it derives. Figure 1-8 illustrates this process. In many cases, you are receiving information from multiple sources; therefore, the homogenization process will not only cleanse the data in terms of master data inconsistencies but also for the differences between the sources.

Figure 1-9 shows an overview of the architecture of the SAP BW system. The architecture for the SAP BW system has three levels. The lowest level shows the source systems. SAP provides extraction mechanisms for production data from SAP systems. For non-SAP systems, there are the BW BAPI interfaces, the interfaces for accessing relational database systems and multidimensional applications, and finally an interface for processing XML files. There are multiple ways to upload data into the BW system, including the use of flat files.

The second level is where the metadata and application data (master and transaction data) are managed in the Business Information Warehouse server. When a report (query) is executed, the OLAP processor reads the data. The third level shows the different reporting tools: BEx Analyzer, embedded in Microsoft Excel, and BEx Web Analyzer, embedded in BEx Web. You can use the Web Analyzer to execute queries in the browser. There are numerous approaches to viewing the data, and we will get into each one in a later chapter. You can access the information via your cell phone or any other portal interface. The structuring and
visualization of all information is ensured by the use of BW database structures and the requirements and expectations on reporting. This data can be from both SAP and non-SAP sources and is extracted and uploaded into the SAP BW system.

One of the fastest approaches to implementing SAP BW is the use of Standard Business Content (SBC), which is composed of preconfigured models based on best business practices from all the different industries that have implemented the SAP systems. All of this content can be used by any of the industries and can be adapted to individual enterprise requirements. As shown in Figure 1-10, the structures available in the SBC of SAP BW consist of roles, workbooks, queries, InfoCubes, InfoObjects, InfoSources, Update Rules, Transformation Rules, and many other objects. We will be looking specifically at the SBC for the reporting process in Chapter 14 of this book.

The Standard Business Content (SBC) is shipped as an add-on to the SAP BW system. The documentation provides detailed information on the Business Content of the individual applications. The distinct advantage of the Business Content is that it is based on a data model process and you can activate all required and related objects at the same time. Therefore, you can set up and demo the functionality of BW quickly and easily.

**Knowledge Management**

Knowledge Management (KM) enables users to access all sorts of internal and external content via intelligent search functions. The functionality of the KM system allows users to publish documents, browse, classify, or manage content. The publication cycle of documents can be controlled by means of online communication or workflow functions found in KM. Access to information is controlled by means of authorization profiles. The two major areas are Content Management, which supports the life cycle of documents from creation to
archiving, and Search & Classification, which allows full-text searching across all types of documents and enables their automatic classification.

**Master Data Management**

The last area is the integration of master data via Master Data Management (MDM). When an enterprise stores master data in different locations and systems at the same time, this can lead to redundancies and variances, which might significantly disrupt business processes. SAP MDM enables you to create master data that is uniform across the enterprise and to distribute it to different dependent systems. SAP MDM uses the technological basis of the SAP Exchange Infrastructure (SAP XI) to distribute the data. Not only does it distribute the data, but for new master data, it checks whether identical master data objects are already available and generates comprehensive information duplicates, which can in turn be transferred into the SAP BW or used in analyses. This reduces data management costs and significantly simplifies the correction of data errors.

Figure 1-11 shows that MDM is able to help by

- Offering to generate content that is consolidated.
- Working to harmonize the master data.
- Having an identified location for the Central Master Data Management.
**Process Integration**

At the Process Integration level, the system offers the ability to implement cross-system business processes, with the help of the SAP Exchange Infrastructure (SAP XI). Within the overall architecture of SAP NetWeaver, SAP XI takes care of the process integration. It enables the connection of SAP and non-SAP systems from different suppliers in different versions on different platforms—whether it is Java, ABAP, or any other source system. SAP XI is based on an open architecture, mainly used for open standards (specifically for XML and Java) and offers services that are essential in a heterogeneous and complex system infrastructure, such as a runtime infrastructure for exchanging messages, configuration options for controlling business processes and the flow of messages, as well as options for transforming message content between sender and receiver. Basically, the SAP Exchange Infrastructure includes

- **System Landscape Directory** This is where the system landscapes are mapped.

- **Integration Repository** This repository stores all the required interfaces entered in the design phase. These are used for mapping the master data and checking the format of the data to be exchanged.

- **Configuration phase** During this phase, the mappings completed in the Integrated Repository are assigned to each other based on the system infrastructure and business processes in question. Once this is complete, the application content is transferred from the sender to the receiver via messages in a freely definable XML structure.
In Figure 1-12, the sending system makes the data available in the document format, IDocs, and sends it to the adapter via a protocol. The adapter transforms the document to SAP XI format and sends it to the Integration Server using HTTP(S). During configuration, you specify which adapter the receiver is to use to receive the message. The Integration Server sends the message to the corresponding adapter, which converts the message to the receiver’s protocol and sends the message to the receiver.

**Figure 1-12** Connecting different systems to SAP XI

SAP MDM supports a step-by-step development toward connected master data management in a distributed, heterogeneous environment.

**Figure 1-11** Integrated Master Data Management with SAP MDM

In Figure 1-12, the sending system makes the data available in the document format, IDocs, and sends it to the adapter via a protocol. The adapter transforms the document to SAP XI format and sends it to the Integration Server using HTTP(S). During configuration, you specify which adapter the receiver is to use to receive the message. The Integration Server sends the message to the corresponding adapter, which converts the message to the receiver’s protocol and sends the message to the receiver.
Application Platform

With the SAP Web Application Server, the Application Platform has the J2EE and ABAP runtime environments and supports web applications and web services in an open development environment. As Figure 1-13 shows, these basic platform structures support all areas of NetWeaver 2004S.

Nearly every SAP system is based on the SAP Web AS as a runtime environment. The SAP Web Application Server (WAS) has, in addition to the traditional runtime environment for ABAP programs, a runtime environment for J2EE-based Java programs, called the SAP Web AS Java. Thus, the SAP Web AS, together with the database, is the Application Platform of SAP NetWeaver.

SAP Web AS is the logical result of further development of the SAP Application Server technology with particular attention being paid to the web-based application. This platform offers a reliable and tested runtime environment that has evolved over more than 10 years, a framework for executing complex business processes that meet the highest security standards, and a reliable and user-friendly development environment. It supports open technical standards such as HTTP, HTTPS, SOAP, SSL, SSO, Unicode, XML, WML, and others, and supports various operating systems and database systems. Figure 1-14 offers a view of each of the options within the Web Application Server (WAS).

SAP Business Warehouse Administration

Before we move into the details of the reporting process and the objects that support the creation and execution of queries, I would like to go over the process in SAP BW that supports data processing and the management of data loading. Much of what we will be
looking at in the next chapters is dependent on the setup and processing that you do during the configuration and implementation of BW data uploading. Therefore, I believe it is worthwhile that we look at this activity and understand that it can provide you data for reporting in the best possible format and structure. In the end, it’s all about reporting the data and having the information in exactly the correct format for your business users—whether this is the CEO, CFO, or a line manager. Therefore, we need to look at some of the options we have in the way of processing the data initially in order to have the data in the right place at the right time and in the best possible format. This portion of BI, Business Warehouse, is the data warehousing solution and supports many of the other products and functionalities of the SAP systems. If you were to look at the architecture of the various applications supported by the BW area, you would see that it is the foundation of many activities and is the main platform for the reporting of information and storage of data. As you can see in Figure 1-15, NetWeaver supports many of the applications shown here, and within NW2004S, Business Warehouse is the central storage location for data.

In this case, the information from SCM (Supply Chain Management) is used in the Customer Relationship Management (CRM) process, which is processed through the ECC environment and then moved through the Business Intelligence system to be displayed in the Enterprise Portal (EP). All this data moves through Business Warehouse.

As a core component of SAP NW2004S, BI provides data warehousing functionality, a Business Intelligence platform, and a suite of Business Intelligence tools that enable
businesses to attain the maximum value from the information they collect. Relevant business information from productive SAP applications and all external data sources can be integrated, transformed, and consolidated in BI. BI provides flexible reporting and analysis tools to support you in evaluating and interpreting data and distributing that information to others in your company, even across the globe. With this capability, businesses are able to make informed decisions and determine target-oriented activities on the basis of this analysis. Figure 1-16 defines what SAP believes are the key components of a BI system. We will focus the majority of our time on the BI suite and touch on portions of the BI platform where they pertain to reporting and analysis. The actual Data Warehouse area of BI is discussed at a high level in the next section.

**Data Warehouse Layer**

The Data Warehouse layer is responsible for the cleansing, loading, storage, and management of the data needed for enterprise reporting and analysis. To help facilitate the implementation of this data layer, SAP delivers Standard Business Content. This is a preconfigured set of objects that have been developed based on best business practices and should be used to bridge the gap in functionality between your current system setup and what the SAP data warehouse can offer. With this BI content, SAP provides all the structures, objects, queries, and transfer processes that cover a large portion of what a typical project requires. Here are the Data Warehouse requirements that were taken into account in the development of this layer:

- A data warehousing system must have optimized data structures for reporting and analysis.
- The data warehouse needs to be a separate system so that it supports all types of data, both SAP and non-SAP.
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- The data warehouse needs to be an automated system to process data.
- The data warehouse must have preconfigured objects based on specific industries and businesses.

Figure 1-17 identifies the different items in the BI Platform and Data Warehouse level. As you can see the Data Warehouse architecture is structured in three layers: sourcing the data, storing the data, and reporting on the data.

This discussion focuses on the bottom two layers—the data warehouse and data acquisition process. *Data acquisition* refers to the source system that provides the BI system with data. BI can integrate with many source systems of data, including an SAP business suite, SAP XI, non-SAP systems (including flat files), other data providers (other BW systems), databases (DB Connect), and complex sources (universal data integration, or UDI).

**Data Acquisition**

SAP business suites include any SAP-related source of data, such as SAP CRM, SAP SCM, SAP SEM, and others. In this area, SAP offers predefined extraction structures and programs that help with sourcing the data and uploading it into the BW system. Figure 1-18 shows numerous source systems and the connection to BW. In this process, the datasource is used as the structure to extract the desired transactional data from the source systems tables into the BW tables (specifically InfoCubes and DataStore objects). You can also send data from SAP and non-SAP sources to BI using SAP Exchange Infrastructure (SAP XI). Once in BI, the data is queued and is available for further integration and consolidation. Data transfer using SAP XI is based on the Simple Object Access Protocol (SOAP). SAP has an open system standard and enables all external systems to be integrated. At the center of the infrastructure...
BI Architecture: Platform and Data Warehouse

Data Acquisition Layer: Architecture

Source System Types

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FIGURE 1-17  Architecture of the BI platform services and warehouse components

FIGURE 1-18  Data acquisition
is XML-based communication using HTTP. The application-specific contents are transferred in messages in user-defined XML from the sender to the receiver using the Integration Server (part of SAP XI). Another datasource would be non-SAP systems; the BI architecture offers the ability to integrate with any external source of data. One of the methods within BI to facilitate this process is the Open Hub Service. This functionality offers the ability to link external file systems to BI, then upload the data directly into another database file or flat file (Excel document) from the InfoCube. You can also access information from one BW and upload it to another BW (specifically to a Data Target in that BW system) system or share information within a BW system with other data targets in that same system (InfoCube-to-InfoCube exchange of data—DataMarting) so that you can stage the granularity of the data in the BI system in storage layers. Another method of uploading data into the BI data warehouse is via the use of DB Connect, which offers direct connections to an Oracle Database system. For example, the DB Connect functionality offers a direct connection to a legacy Oracle DB and the ability to create a series of structures that directly link the BI objects to the Oracle DB and offer direct uploads of data. For more complex uploads, you can use the UDI (Universal Data Integration), which offers an integration process similar to the use of a third-party system, to integrate BW with another source of data such as Hyperion.

ETL is the process of extracting, transforming, and loading data. It describes the process of moving data from one source system to another. The source system types describe the extraction activity (see Figure 1-18). In the data extraction process, the transformation process can take place. This can be any sort of manipulation of the raw data—cleansing of the data, aggregation of the data, and other activities to make the data ready and usable in the BI system. As of 7.0 BI, this process is enabled with a new drag-and-drop visual transformation tool for configuration purposes. There are numerous topics in this area, such as the management of delta uploads, full uploads of data, real-time sourcing of data (new for 7.0 BI), currency conversion, and more. These are critical topics that are too involved to get into during this overview, but they are important to understand and manage.

Transformation of the data can involve the summary of the data, enhancing the data (adding more characteristics to a record—for example, if customer is A100, then customer group is R45), developing calculations that occur during the upload (for example, based on sales volume, a salesperson receives a bonus; if the sales volume is $1,000,000, the salesperson receives a bonus of $10,000, and that calculated bonus is included in the record), or any number of different realignments of the data. This is important to understand so that as you query the information, you understand what has happened to the data between the source system tables and the InfoCube you are querying against for strategic information.

Data Transformation
The InfoPackage (IP) and the Data Transfer Process (DTP) are the objects used to execute the transfer of data through the transformation process. As you can see in Figure 1-19, these two items can be used to manage the data loads by filtering the data uploaded (for example, only upload the data from North America) or to manage a check for data consistency, among other responsibilities. The PSA (Persistent Staging Area) is the physical storage level that holds a set of data that is exactly what the source system has, and it can therefore be used for a number of tasks, such as a consistency checks against the data in the source system table to validate the accuracy of the uploaded data.

Figure 1-20 shows the configuration screen from the SAP BI Transformation Rule. The basic process is to map the fields from the source system to the fields in the target system.
FIGURE 1-19 Basic transformation in SAP BI 7.0

FIGURE 1-20 Transformation Rule in SAP BI
These source and target fields can be combinations of a number of different systems, including other BI systems. The portion in the middle of the screen is called the Standard Group, and it can be used in a situation where common rules are used for a number of different source and target combinations. Thus, you can set up a reusable set of rules. You will usually see the two groups linked directly to each other without the Standard Group option. To review the details of each of the rules, right-click the connecting line/link and choose Rule Details to analyze any changes or manipulations being used to upload the data.

In Figure 1-21, you can see the different options that can be used to work with the data during the upload. These are all standard business content elements that are available without any configuration to be used. This is one of the areas where the configuration of system processes can be applied. The Rule Types go from the basic direct assignment between fields to the use of ABAP routines to create complex calculations before the data reaches the InfoCube for reporting. In addition to this, the currency can be converted during the upload, the key figures can be aggregated or adjusted to hold the maximum or minimum of a range (for example, the maximum stock price during a 24-hour session), and you have the ability to assign routines and formulas to the structures to adjust or validate the data as it is uploaded.

The next layer is the Physical Storage layer for the data. I cover this information in more detail in the next chapter and will therefore only expand on this here at a high level. Numerous data storage objects can be used for this task, but specific to this process you use an InfoProvider that is a Data Target. There are Data Targets and Non-Data Targets, and we discuss the differences in more detail in the next chapter. The Data Targets that can store data and are generally used here include the DataStore objects (commonly referred to as the Operational Data layer), InfoCubes (generally the Reporting layer), and InfoObjects (used to store the master data from the source systems). The queries are then created using these objects as their sources of data. We will discuss all these items in detail in Chapter 2.

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**Figure 1-21** Functionality in the Transformation Rule

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Summary

The SAP NetWeaver 2004S platform is the overall system architecture that supports the SAP applications. Within the NetWeaver platform you have a number of different groupings of activities, and one of them in the information level is BI. BI offers a toolkit of options for uploading and accessing data from numerous sources as well as for storing that information for reporting purposes. More specifically, the Business Warehouse is the data warehouse that facilitates the storing and reporting of all the integrated data. It is the only area in the platform that has the breadth of reporting options to give you the ability to format and structure the queries required by your business users.