

## IMPLEMENTATION OF DATA WAREHOUSE SAP BW IN THE PRODUCTION COMPANY

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***Abstract:** in this paper the implementation of Data Warehouse SAP BW in the Production Company is presented. A data warehouse is designed for efficient query processing. The technical environment and data structures are optimized for answering business questions. Data warehouse is stored persistently by time over a particular time period. Users can use comprehensive analysis tools to access data. We will try to answer the question how to implement the SAP Business Warehouse in a company*

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***ACM Classification Keywords:** H. information system*

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### Introduction

Continuous innovation in data processing possibilities is a reason why more information is stored in a more detailed form. There is the need to both reduce and structure this data so it can be analyzed meaningfully.

A data warehouse can help to organize the data here because it brings together all operative data sources with different degrees of detail in order to provide this data in a scalable form to the whole organization. A data warehouse is designed for efficient query processing. The technical environment and data structures are optimized for answering business questions. Data warehouse is stored persistently by time over a particular time period. Users can use comprehensive analysis tools to access data. These tools offer a user-friendly interface which simplifies query creation. End users have read-only access, meaning that the data is primarily loaded into the data warehouse via the Extraction, Transformation and Loading (ELT) process. A data warehouse is a copy of transaction data, specially restructured for analyses.

In this paper we will try to answer the question how to implement the SAP Business Warehouse in a company.

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### SAP Business Information Warehouse Structure and Components.

The data model in SAP Business Warehouse (Fig. 1) describes the data flow of the relevant business information from the source to the analyzable object in SAP BW. In modeling you can create and edit the objects and rules for the Administrator Workbench that are required for data transfer, updating and analysis. SAP BW provides a web-enabled, integrated view of information [BW305, 2005].

#### DataSource

Source Systems are sources that extract data for the SAP Business Information Warehouse. The key element of the SAP BW information is the **DataSource** that contains a number of logically related fields arranged in a flat extract structure used to transfer data into the data Warehouse.

It is transferred into the BW according to the type of source system. If the source system is a SAP system, the metadata is simply copied from the source system. There where the source system is a flat file, the metadata is defined directly in the BW.

On the request data is transferred from the source system into the SAP BW in the selection of DataSource fields that eventually contain information relevant to decision-making about a business process- so called transfer structure.

The data entering the SAP BW from source systems is stored in a transparent, relational database table in the SAP BW. This physical store is the Persistent Staging Area table (PSA table). It is created for every source system DataSource. The request data stored in the PSA table have the same format as the corresponding DataSource transfer structure with extra fields of Data Request ID, the data package number, and the data record number.

When you load data using the PSA table the data records are transferred directly to the transfer structure. Data can be written to data targets from the PSA table by using transformations.

There is a possibility to check or change incorrect data in the PSA table either manually or using a program.

This gives the opportunity to correct update errors or validate data before it is processed in BW InfoSource.

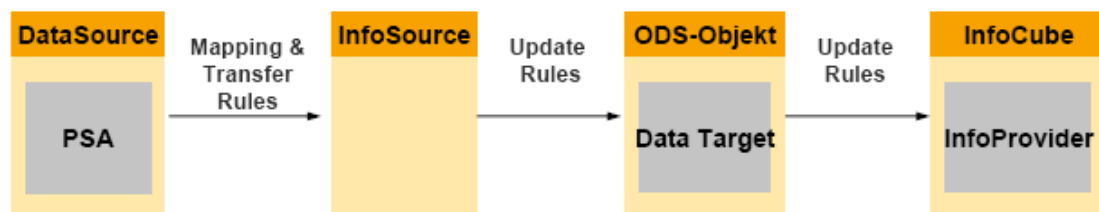


Figure 1. Data Model In SAP BW [BW305, 2005]

## Mapping and Transformation

InfoSource is a quantity of logically related InfoObjects summarized into one single unit. It contain either transaction data or master data with attributes, texts and hierarchies. Individual fields in the DataSource are mapped to the corresponding InfoObjects in the InfoSource by the transfer rules. These rules can be applied easily using formulas. In the maintenance to the transaction rules is also stored the information how the data from the DataSource is to be transferred into the InfoSource [Karine Allard, 2006].

### Update rules

Update rules specify how data is updated from InfoSources into data targets. With InfoCube it must be specified for each key figure and the corresponding characteristics, for an ODS object, it must be specified for the data and key fields, and for an InfoObject it must be specified for the attribute and key fields. The update type allows a control whether a key figure or data field is updated in the InfoProvider.

There are tree types of update: no update, addition, minimum or maximum or overwriting. Various options of calculation methods are used to control whether and how a characteristic, key figure or a data field should be updated in the data target.

Creating a start routine executed for each data package at the beginning of the update is another option for more complex transformations, if the available calculation methods are not sufficient.

### InfoObjects

InfoObjects are the smallest units in BW and divided into characteristics, key figures, units and time characteristics.

**Characteristics** are groups like, for example product, customer group or region. They determine the level of detail in which the key figures are managed in the data target.

**Key figures** deliver the values analyzed in a query. They can be quantities, amounts, numbers.

**Units** give the values of the key figures meaning like units for measure.

**Time characteristics** like date or year.

Master data is a characteristic that have attributes, texts, or hierarchies at their disposal and remains unchanged over a long period of time. Master data contains information's that are always needed in the same way. A hierarchy is always created for a characteristic and it gives characteristics a structure. Properties of key figure influence on the load process and query display. The basic of them are determination of the aggregation and exception aggregation for non-cumulative key figures and the number of decimal places in the query.

### Data Targets

Data targets are the physical objects that stay unchanged during data modeling and when loading the data. Data targets are Basic InfoCubes, ODS Objects, InfoObjects. There are two types of data targets:

- Data targets for which queries can be defined-so called InfoProviders.
- Pure data targets for which no queries can be defined, can only be used as a data source for another InfoCube, ODS object or InfoObject.

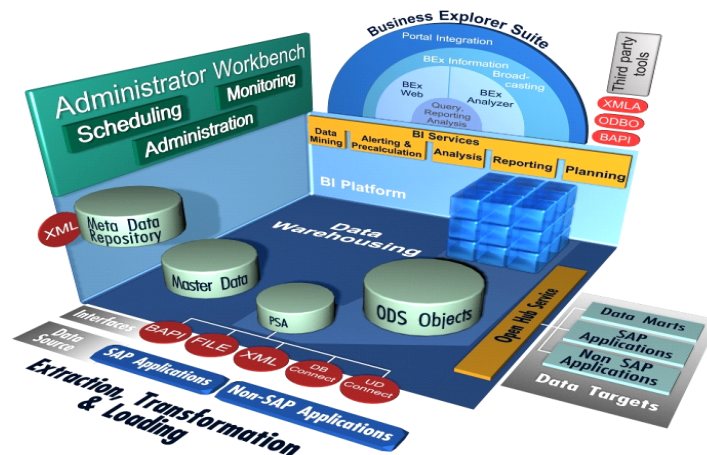


Figure 2. SAP BW Structure Overview [BW305, 2005]

### InfoCube

InfoCubes are the main objects of the multi-dimensional model in SAP BW. Theirs structure is optimized for reporting. On those objects queries and analyses are defined and executed [Karine Allard, 2006].

There are following InfoCube types in SAP BW:

- BasicCube
- Virtual Cube:
- RemoteCube
- SAP RemoteCube
- Virtual InfoCube with Services:

InfoCubes group a set of InfoObjects (characteristics and key figures) together. A structure of a star schema optimized for reporting consist a number of relational tables and a fact table in the center. The fact table and the dimensions are linked to each other using identifying, abstract numbers.

Multi-dimensional data model are used for the creation of data warehousing or analytical applications OLAP applications. The classic star schema is the most frequently used multi-dimensional model for relational

databases. It classifies two groups of data: **facts** and **dimension attributes**. Logically related dimension attributes are stored as a hierarchy within the dimension table. The dimension tables are linked relationally with fact table by foreign or primary key relationships. The dimensional attribute with the finest level of detail of the corresponding dimension table is a foreign key in the fact table. All data records in the fact table can be identified uniquely.

### ODS Objects

An ODS object acts as a storage location for consolidated data. The data in ODS objects is stored in transparent, flat database tables and can be updated with a delta update into InfoCubes or other ODS objects.

### InfoProvider

An InfoProvider is an object for which queries can be created or executed in the Business Explorer.

InfoProviders are the objects or views that are relevant for reporting.

However, objects that physically contain data also fall under the term InfoProvider. These are also called data targets:

- InfoCubes
- ODS Objects
- InfoObjects (characteristics with attributes, texts or hierarchies)

## SAP BW Source Systems

The SAP has a wide functionalities to support extract of data at file or database level. Sources that can be used for transferring data to SAP BW (is show in figure 3).

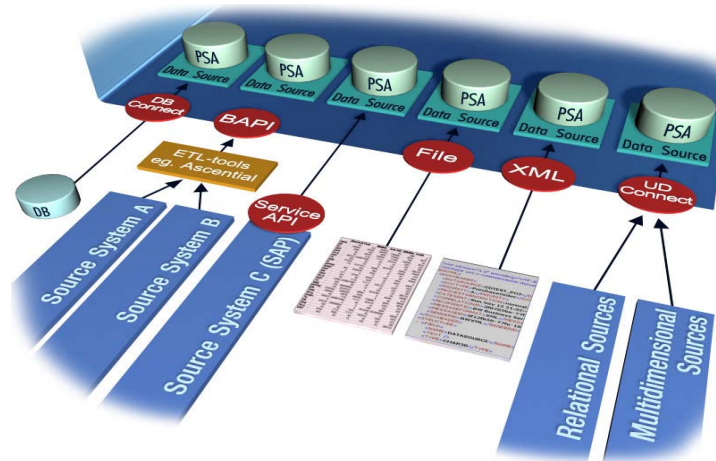


Figure 3. Openness of SAP BW in relation to sources supported for data transfer [BW305, 2005]

- **Transferring Data from SAP Source Systems**

SAP application-level components like SAP R/3, mySAP CRM or mySAP Supply Chain Management integrate with SAP BW using the BW Service API (SAPI) technology package.

- **Transferring Data Between Data Targets Within a SAP BW Data Mart Interface**

The data mart interface is a functionality that makes it possible to update data from one data target into another. It's possible to exchange the data between several BW Systems, between BW systems and additional SAP systems – for example APO systems, BW system (myself connection).

Data marts can be used to save a subset of the data for a data warehouse in another database, better manageability and maintenance or intentionally redundant segments of the global system.

- **Transferring Data from Flat Files**

SAP BW offer very easy transfer of data from flat files, ASCII, CSV format (Comma Separated Value).

Flat file data may be transferred to the SAP BW unchanged from a application server using a file interface. Defining and updating metadata for flat files must be done manually and have to correspond to data target in SAP BW.

Flexible updating from flat files data is possible because of maintaining the transfer structure. Preview able you to check, whether the metadata definition in BW and the structure file mach to each other.

- **Transferring Data Based on the Simple Object Access Protocol (SOAP)**

Data transfer in SAP BW uses a data request sent from SAP BW to the source system. Sending data through external controls is called a data push and take place using transfer mechanisms. The transfer can: use the SOAP service of the SAP Web AS, A Web Service or SAP XI. [BW310, 2005] .

Inbound queue occurs data push in SAP BW. For DataSource, so called DataSource with SOAP connection, with interface to supply the delta queue, system generates an RFC-compatible function module

- **Transferring Data from a System Using Third-Party ETL Tools . Staging BAPIs**

To enable the extraction of data SAP BW offers open interfaces, the staging BAPIs at application level. BAPIs are the programming interfaces that enable external access to the business processes and data.

Third-party tool loads the data from the external system and transforms them to SAP BW format.

- **Transferring Data from Database Management System Tables / Views - DB Connect**

DB Connect is used to datatabase connection as to source systems.

Functionality Multiconnect enable to open database connections in addition to the SAP default connection and use these connections to access external databases. DB Connect allows you to load data by linking a database to the BW generate a DataSource.

- **Transferring Data with UD Connect**

UD Connect (Universal Data Connect) give the opportunity of access both non-SAP data

sources and SAP data sources using the SAP Web AS J2EE connectivity. Using UD Connect, allows to

connect a lot of relational and multi-dimensional data sources to SAP BW. UD Connects transfers the data as flat data.

- **SAP BW as Source System**

The Open Hub Service is available for making opportunity for BW system to act as a source system for additional BW systems.

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## Performance-Optimized Data Target Modeling

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There are a number of functionalities in modeling data targets to support you in improving the load and query performance of your BW system. Optimizing Performance for InfoCubes [BW310, 2005] .

- **Partitioning**

Partitioning is used to split up the whole dataset into couple small and redundancy-free units. That's cause increasing performance.

- Database and Aggregate Table Indexes

Checking and repairing the table's indexes improves load and query performance. Indexes created in the fact table for each dimension improves search process.

- Database Statistics

The query performances optimized by the database statistics. Update the statistics should happen every time when more than a million new records appears in the InfoCube.

- Compressing InfoCubes

Summarize a requests and insert them at the same time also increase the performance.

## Implementation of SAP BW in a Company

Every company wants to structure their Business Warehouse according to the analysis of reporting requests and the data model. Task for the administrators is to examine the Business Content to see which standard Content objects can be used for the data warehouse as well as which additional, customer-specific settings have to be implemented.

The Administrator Workbench is the central point in data warehouse SAP BW responsible for managing processes [SAP BIW, 2005]. Data Warehouse Management in the SAP BW includes the maintenance of authorizations, the metadata repository, transporting, tools for activating SAP Business Content, technical content, an analysis and repair environment, and tools required for process management.

### Authorizations

An authorization allows a user to carry out a certain activity in the Business Information Warehouse. Each authorization refers to an authorization object and defines each field that is contained in the authorization object. Authorization profiles are made by system administration by summing of a individual authorizations.

The screenshot displays the SAP Administrator Workbench interface. The left sidebar shows the 'Metadata Repository' menu. The main window is divided into two panes. The left pane shows 'Activated objects in s' with a list of objects including KPIs, InfoArea, Application, InfoObject Catalog, Role, Workbook, Query, Web Template Name, Web Item, Query View, MultiProvider, InfoCube, InfoObject, InfoSet, Classic InfoSet, InfoSet Query, ODS Object, Update Rules, InfoSource, Transfer Rules, DataSource / FileSource, Source System, InfoPackage Group, InfoPackage, InfoSpoke, and Open Hub Destination. The right pane shows the 'InfoCube : SAP DemoCube' configuration page. It includes a table with metadata and a table of InfoObjects.

Object type	Name	Technical name
Characteristics	Company Code (SAP Demo)	OD_CO_CODE
	Country	OD_CO_CODE_OD_
	Distribution Channel (SAP Demo)	OD_DIS_CHAN
	Division (SAP Demo)	OD_D_IV
	Material (SAP Demo)	OD_MATERIAL
	Material group	OD_MATERIAL_OD
	Product hierarchy (SAP Demo)	OD_PROD_HIE

Figure 4. Areas of the Administrator Workbench metadata repository and information on the SAP DemoCube InfoCube [BW310, 2005]

For administrators special authorizations is needed in the BW and in the source system, BW roles (is show in Fig. 4).

- BW Administrator (development system): maintain the source system, upload Metadata, execute queries for the statistics InfoCube and maintain aggregates.
- BW Administrator (production system): maintain the connection to the source system and execute queries for the statistics InfoCube.
- Modeler (development system): design the data targets and InfoProvider, InfoObjects, InfoSources and the data flow, define communication structures and transfer and update rules.
- Operator (production system): upload data from the source, system and monitor the results.
- Reporting Developer (development system): design the queries for the reports
- Reporting User: execute queries using the BEx Analyzer or in the Web.

### Metadata Repository

Metadata repository allows to display information on the metadata objects. This metadata includes object properties and their relationships to other objects. The available functions in the Metadata Repository are:

- Displaying information about active objects in the BW system or on the Business Content objects
- Various formats of displaying the information about metadata objects graphically.
- Search in the metadata repository.

### Business Content

Business Content gives a lot of opportunities for saving costs and time. Technical and content-prerequisites shorten the implementation process and InfoCubes are already optimized for data storage and analyses. Predefined analyses are the examples of content in projects. User who use prototyping help can correspondingly specify which information is still missing for the project configuration.

Business Content collects information and prepares it for next use. It's based on an data model that's preconfigured and based on tasks stemming from consistent metadata.

Business Content collect's SAP and non-SAP extractors, DataSources (extraction structures), InfoObjects, InfoSources, InfoProviders (for example, InfoCubes and ODS objects), Queries, KPI's and Templates.

Business Content can be used without any adjustments. It can also can be adjusted by means of enhancements and served as a template for customer-specific objects.

### Technical implementation in SAP BW

After activating a master data-carrying characteristic, master data tables (attributes, text, hierarchies) are generated in the characteristic maintenance. Before creating and subsequently activating the characteristic InfoObject. a text table is created when the *With texts* checkbox is flagged.

To store the hierarchical relationships between characteristic values the hierarchy table (H table) is used SID Tables shows the connection between master data-carrying characteristics, navigation attributes and external hierarchies.

To use an InfoSource with Direct Update to Load Attribute Data from an SAP R/3 System there's four steps to do: Set the Global Transfer Routine, create an InfoSource with Direct Updating, create a Generic DataSource and create and Activate Transfer Rules.

To load transaction data from an SAP R/3 System ther's a schedule do to:

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- **Create Update Rules**

DataSource need to be preconfigured to load transaction data from the SAP source system. A lot of combination is available in Business Content. Connection between InfoSource and InfoCube is possible because of set of update rules.

- **Create InfoPackage and Load Data**

Extraction of data from the source system to InfoCube must be preceded by create an InfoPackage containing the parameters for the data extraction.

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## Conclusion

Reporting, analysis and interpretation of business data is a central focus for companies that wants to guarantee competitiveness, optimize processes and to be able to react quickly and in line with the market. **SAP Business Information Warehouse (SAP BW)** as a core component of SAP NetWeaver data warehousing functionality, provides both a business intelligence platform and a suite of business intelligence tools.

By using SAP BW companies can easily and quickly get the tool that will meet all their requirements. Business Content which contains a great variability of an Info Objects works great in a most of modules of company like Sales, Purchasing, Logistic and Production Planning.

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