CHAPTER 5: BUSINESS ANALYTICS

Objectives

The objectives are:

- Describe Business Analytics.
- Explain the terminology associated with Business Analytics.
- Describe the data warehouse and the elements of the data warehouse.
- Set up the Microsoft Dynamics NAV Configurator.
- Explain the process of setting up BA Databases.
- Explain and demonstrate setting up virtual cubes and mapping existing dimensions to a cube.

Introduction

Business Analytics (BA) is a decision support and analysis tool that provides users with a range of visibility, both detailed to aggregated, into different aspects of their business. It allows users to quickly get to the information they are looking for at the desired level of detail.

BA was designed to make advanced features and analytical capabilities available to end-users without the need for long implementation cycles and lengthy training in complex software. It capitalizes on an implementer's knowledge of Microsoft Dynamics NAV, and in its basic version, the user's experience with Microsoft® Excel®. Business Analytics Advanced provides an environment that includes predefined "smart calculations," and the ability to create advanced calculations and complex charts. Because the process for setting up BA Advanced is involved, and this course is designed to give information workers ready access to available analysis and reporting capabilities, BA Advanced will not be covered.

This section introduces concepts related to any data mining software, including SQL Server Analysis Services. These concepts include online transaction (OLTP) processing and online analytical processing (OLAP), data marts, measures, dimensions, and cubes. In this chapter, you will create data cubes. In the following chapter, you access these cubes using Excel, and perform your data analysis there.
Business Analytics Overview

Business Analytics helps businesses derive and analyze information from raw data. The data mining process involves the following:

- Examining the raw data in several different contexts and from several different points of view.
- Determining how these facts relate to other data.
- Understanding how this data reflects overall business goals and objectives.

Business Analytics

Business Analytics is data analysis software that aims to fulfill most of the data analysis needs of all decision makers in a company.

While Business Analytics has reporting capabilities, it is mainly an analytical tool that supports dynamic objects to enable or empower decision makers to make the right decisions at the right time.

Another major benefit of Business Analytics is its language capabilities. You can share analysis between employees from different countries without translation. This is handled completely automatically by the language tier of Business Analytics, ensuring smooth and fast sharing of vital information across the enterprise.

Business Analytics and Microsoft Dynamics NAV

The base Microsoft Dynamics NAV solution Business Analytics tool:

- Collects data from multiple domains within Microsoft Dynamics NAV.
- Arranges the data in a hierarchical form.
- Lends itself to users for analysis purposes through a client.

The client chosen for the base solution is Microsoft® Excel®, although a variety of other clients are available. Through the client, users can roll up or drill down at the desired level of detail for easy data analysis. For example, users can see the total sales across all products, and then drill down to the sales at the product family level, or to a detailed product level.

Because most analysts use Excel for data analysis purposes, it is used as the client for the base solution. It serves as a good two-dimensional client to represent data, with capability to not only represent data, but to also allow users to manipulate it using their own formulas.
Terminology Associated with Business Analytics

A typical Business Analytics solution incorporates three essential components:

- A database
- Online Analytical Processing (OLAP)
- Desktop BA tools - the Microsoft Dynamics NAV Data Configurator.

These concepts and the terminology associated with them are defined first, and then you will create your own OLAP cubes using BA.

Online Transaction Processing/ERP

Online Transaction Processing (OLTP) constitutes the origin of data: the database. OLTP systems are often also categorized as ERP (Enterprise Resource Planning) systems and are all designed to store data transactions.

ERP solutions such as Microsoft Dynamics NAV collect or gather transactions in database structures. These databases are the foundation of the data mart used by the BA tool. Data is retrieved from the ERP database through Online Analytic Processing, or OLAP, cubes.

Online Analytical Processing

Online Analytical Processing (OLAP) is effectively the processing unit. To make queries happen more quickly, business intelligence applications use a technology called OLAP. OLAP pre-processes the data in an information unit called a cube, making it quicker and easier to find.

In Microsoft Dynamics NAV, OLAP is performed by Microsoft® SQL Server® Analysis Services, a capability that is part of SQL Server 2000 or later.

Configuring OLAP Cubes

The Microsoft Dynamics NAV Configurator is a set-up utility that creates the definition of cubes, and the schema of fact tables and dimension tables. In addition, it also creates the necessary data import scripts that are used by Microsoft DTS (data transformation services) to migrate data from the Microsoft Dynamics NAV database to the data warehouse of the BA solution.

The Configurator can be further divided into two separate components:

- One for the definition of a configuration.
- Another one for creation of actual configuration based on a pre-defined configuration.
This tool defines the attributes of OLAP cubes by selecting the data elements from Microsoft Dynamics NAV. The configurations are stored in an XML form with certain tags and attributes, drawing upon table relations, option captions, and field data types already existing within Microsoft Dynamics NAV.

The Configurator enables a user to:

- Save multiple configurations.
- Create a new configuration.
- Delete a configuration.
- Edit a configuration.

It is possible to have several definitions existing at the same time, although only one will be active at a time.

**Data Warehouse**

A data warehouse is a database specifically designed for querying large amounts of data. In theory, a data warehouse can embrace all data in the enterprise, depending on how data cubes are set up for data extraction. In a data warehouse, there are two groups of data:

- Measures
- Dimensions

The OLAP engine does not work directly against the Microsoft Dynamics NAV database. BA migrates the necessary data from Microsoft Dynamics NAV to a separate database and arranges it to facilitate large queries. This database is usually referred to as a data warehouse.

**Data Marts**

Data marts represent a subset of data from the enterprise from which the analysis is drawn. The data warehouse contains a collection of data marts combined together. Each data mart keeps data for a particular subject area along with the definition of dimension tables.

The dimension tables keep mapping between the members of a group and the group definition, such as, mapping that specifies which products belong to a product family. In addition to the dimension tables, data marts also contain a fact table that stores the data to be aggregated at the lowest level of detail, such as, employees' salary data in a human resource system.
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Measures
Measures are logical data types in a data mart. Measures are the numerical values of principal interest to end users. These are the rules of measures:

- A measure always represents a numerical value from the underlying table. If a field in a database table has not been defined as numerical, it cannot be used as a measure.
- All measures are numerical values, but not all numerical values are measures. Users decide through definition during the implementation process if a number is interesting enough to use as a measure. Otherwise it can only be used as a dimension.

Dimensions
Dimensions are the way data is categorized in the data mart. They are the attributes or descriptive properties of the measures that provide information about the measures. Dimensions can be based on all physical data types.

Several related dimensions can be collected or unified in a single dimension that displays the same general dimension in several levels containing different levels of detail. These are called hierarchies and are frequently used when building dimension structures in Microsoft Analysis Services.

Dimension Tables
Dimension tables contain only dimension values. A numerical value in what is defined as a dimension table cannot be used as a measure in that context.

Fact Tables
Fact tables always contain both measures and dimensions. Fact tables are the core of the star scheme and snowflake scheme structures.
Start Scheme

A star scheme, or star scheme construct, is a fact table with zero or more related dimension tables. A star scheme is recognized by the fact that all dimension tables (if any) are directly linked to the fact table.

![Star Scheme Diagram](image)

**Figure 5-1: Star Scheme Diagram**
Snowflake Scheme
A snowflake scheme, or snowflake construct, is based on a star scheme.

The only difference is that this scheme contains dimension tables that are not directly linked to the fact table.

Figure 5-2: Snowflake Scheme Diagram
Setting up the Microsoft Dynamics NAV Configurator

In Microsoft Dynamics NAV, the most common task in using BA is to set up a new cube or to modify an existing cube. Therefore the user interface has been designed to make that task as easy as possible.

Setting up a new cube still requires some basic knowledge about the database structure in Microsoft Dynamics NAV, but to a large extent it is possible to use the existing, built-in information in the database.

Because it is possible to set up cubes and use them in several companies, the first step is to set up cubes and then assign a company.

Demonstration: Set up a New Cube
To set up a new cube, follow these steps:

1. On the Navigation Pane, click Administration > Application Setup > General > Business Analytics Setup.

2. Click the line for Cube.
3. Click Functions > New.
5. In the Fact Table No. field, click the AssistButton. The Objects window opens.
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7. Click OK. The object information is added.
8. In the Name field, edit the beginning of the name to include NEW_.

NOTE: The Name field is edited because the database already contains a cube with the same name. The Update XML process will not run if cubes have the same name.

In setting up your cube, you will use the following options from the Cube button on the BA Db. Cube Card window.

<table>
<thead>
<tr>
<th>Menu Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Related Tables</td>
<td>Optional. Used, for example, to extend the detailed customer ledger entry with information from the customer ledger entry table and the customer table. This produces the Snowflake Scheme.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Dimensions categorize data in the data mart. They are the attributes or descriptive properties of the measures. They provide information about the measures.</td>
</tr>
<tr>
<td>Measures</td>
<td>Measures are logical data types in a data mart. Measures are the numerical values of principal interest to end users.</td>
</tr>
<tr>
<td>Functions</td>
<td>Optional. Functions are used to build upon existing measures.</td>
</tr>
</tbody>
</table>

Steps to Set up Related Tables
To set up related tables for the new cube, follow these steps:

1. Click Cube > Related Tables.

![Figure 5-4: BA Db. Cube Table Relations Window](image-url)
Business Intelligence for Information Workers in Microsoft Dynamics™
NAV 5.0

2. Click the Select Fields button. The BA Field Selection window opens. This window is used to select additional information to bring into your cube. Microsoft Dynamics NAV displays the tables that are related to the chosen Fact table.

3. In the BA Field Selection window, select the Selected check boxes for the following fields:

* No. 2, Customer Ledger Entry No.
* No. 9, Customer No.

4. Click OK. The tables and fields are now displayed in the BA Db. Cube Table Relations window. The related tables are now set up for the cube.

5. Close the BA Db. Cube Table Relations window.

Steps to Set up Measures
To set up measures for the new cube, follow these steps:

1. Click Cube > Measures.

2. Click the Select Fields button.
   The BA Field Selection window opens. This window lists all of the amount fields in all of the tables in the cube. In this case, the tables are the Detailed Cust. Ledg. Entry table, as well as the Customer and Customer Ledger Entry tables from the Related Table setup.
3. Select the **Selected** check boxes for the following amounts:

   * No. 7, Amount
   * No. 8, Amount (LCY)

4. Click **OK**. The tables and fields are displayed in the **BA Db. Cube Measures** window. The Measures are now set up for the cube. Note that the **Name** field can be modified as needed.

5. Close the **BA Db. Cube Measures** window.

**Steps to Set up Dimensions**

To set up dimensions for the new cube, follow these steps:

1. Click **Cube > Dimensions**.

![Figure 5-6: BA Db. Cube Dimensions Window](image)

2. Click **Functions > Select Fields**. The **BA Field Selection** window opens, with fields from the three related tables.

   - If fields are selected that have a table relation or are of type Option (like the Document Type), Microsoft Dynamics NAV checks whether an appropriate dimension already exists, and if not, it creates one. If the field type is Option, Microsoft Dynamics NAV also creates a Numbered List (Enumeration) for it that will form the basis for that dimension.
3. For the Customer Ledger Entry table, select the **Selected** check boxes for the following fields:

* **No. 3**, Customer No
* **No. 4**, Posting Date
* **No. 5**, Document Type
* **No. 11**, Currency Code
* **No. 21**, Sell-to Customer No.

4. Click **OK**. The tables and fields now appear in the **BA Db. Cube Dimensions** window.

**Steps to Add Another Dimension**

To assign the dimensions to the cube Dimension, follow these steps:

1. In the **BA Db. Cube Dimensions** window, click **Functions > Select Dimensions**. The **Dimension Selection** window appears.
2. Select the **Area** dimension check box.
3. Click **OK**. The Area dimension has been added to the **BA Db. Cube Dimensions** window. Dimensions are now set up for the cube.

**Steps to Set up Functions**

To set up functions for the new cube, follow these steps:

1. Click **Cube > Functions**.

![Figure 5-7: BA Db. Cube Functions Window](image)
2. In the Measure Line No. field, click the AssistButton, and select Amount (LCY).
3. Click OK.
4. In the Time Dimension Line No. field, click the AssistButton and select Posting Date.
5. Click OK. The BA Db. Cube Functions window is populated with the Functions selections. The functions are now set up for the cube.

Steps to Review the New Cube

To review the new cube setup, follow these steps:

2. In the BA Db. Overview window, click the plus (+) sign to expand the Cube line.
3. Click the cube for NEW_Detailed Customer Ledger Entries.
4. Expand the Cube. Table relations, Measures, Functions, and Dimensions are displayed. Expand each to review the setup.

![Figure 5-8: BA Db. Overview Window, Expanded Nodes](image)
Steps to Update the XML
Whenever cube definitions are changed, the XML must be updated.

To update the XML, follow these steps:

1. In the **BA Db. Overview** window, in the **Name** field, click the **AssistButton**. The **BA Databases** window opens.

![BA Databases Window](image)

**FIGURE 5-9: BA DATABASES WINDOW**

2. Click **Functions > Update XML**.

Setting up BA Databases

Before using the Business Analytics Configurator to configure a BA database in SQL Analysis Services, a BA database must be set up and the data cubes to export must be defined. The data cubes are already defined for the DEFAULT database.

**Demonstration: Set up BA Databases**

To set up a BA database, follow these steps:

1. On the **Navigation Pane**, click **Administration > Application Setup > General > Business Analytics Setup**.
2. In the **Name** field, click the **AssistButton** to open the **BA Databases** window.
3. Press F3 to insert a new row.
4. In the **Code** field, enter a unique identifier for this BA database.
5. In the **Name** field, enter a short description of the BA database.
6. In the **Path to Configurator** field, click the **AssistButton**, and browse to the Configurator.exe file. This file triggers the Configurator. It can be downloaded from Partnersource; you can find it by searching for "Business Analytics for Microsoft Dynamics NAV 4.0 SP3"

7. Click **Open**.
8. Click **BA Databases > Companies**. The **BA Db. Companies** window opens. This window displays all companies that exist in this database. The current company has been selected as default, but any of them can be selected. Repeat steps 3-8 for all BA databases that need to be set up. However, only one database can be active at a time. To indicate the database you intend to use, select the **Active** check box for that database.

9. Close the **BA Db. Companies** window.

**Demonstration: Schedule the Configurator to Run Automatically**
The Configurator engine can be set up to run automatically at the same time every day.

To complete this set up, follow these steps:

1. In the **BA Databases** window, click the database with the Configurator to schedule.
2. Click **BA Databases > Schedules**. In the **BA Db. Schedules** window, the first line contains a default time that can be changed. Additional lines can also be added to have the engine run automatically more than once a day.

**NOTE**: In addition to running automatically on a schedule, the Configurator can be started manually at any time. To run the Configurator at an unscheduled time, on the **BA Db. Overview** window, click **Functions > Start Configurator**. For security reasons, the Configurator must be run on the same server that hosts the OLAP database.
Lab 5.1: Create a New Cube

Scenario
A new Sales cube must be created based on the Detailed Customer Ledger Entry table. Create a new Sales database, and then set up the new cube based on the following criteria:

<table>
<thead>
<tr>
<th>Type</th>
<th>Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fact Table</td>
<td>379</td>
</tr>
<tr>
<td>Related Table</td>
<td>9 (Customer No.)</td>
</tr>
<tr>
<td>Dimensions-Customer</td>
<td>35 (Country Code)</td>
</tr>
<tr>
<td>Dimensions-Detailed Cust. Ledg. Entry</td>
<td>3 (Entry Type)</td>
</tr>
<tr>
<td></td>
<td>4 (Posting Date)</td>
</tr>
<tr>
<td></td>
<td>5 (Document Type)</td>
</tr>
<tr>
<td></td>
<td>9 (Customer No.)</td>
</tr>
<tr>
<td></td>
<td>10 (Currency Code)</td>
</tr>
<tr>
<td></td>
<td>12 (Source Code)</td>
</tr>
<tr>
<td>Measures-Detailed Cust. Ledg. Entry</td>
<td>7 (Amount)</td>
</tr>
<tr>
<td></td>
<td>8 (Amount (LCY))</td>
</tr>
<tr>
<td></td>
<td>16 (Debit Amount)</td>
</tr>
<tr>
<td></td>
<td>17 (Credit Amount)</td>
</tr>
<tr>
<td></td>
<td>18 (Debit Amount (LCY))</td>
</tr>
<tr>
<td></td>
<td>19 (Credit Amount (LCY))</td>
</tr>
<tr>
<td></td>
<td>39 (Remaining Pmt. Dsc. Possible)</td>
</tr>
</tbody>
</table>

After setting up the cube, open the Country/Region dimension and add the name to the Field Numbers. The final steps are to activate the database and update XML.
Challenge Yourself!

1. Create a new cube as specified in the scenario.
2. Update the XML.

Need a Little Help?

1. Open the **BA Db. Overview** window.
2. Open the **BA Databases** window.
3. Create and open the new sales database.
4. Create the new cube.
5. Add the related tables.
6. Add the dimensions.
7. Add the measures.
8. On the **BA Db. Overview** window, open the Dimensions, and add the Name to the Country/Region dimension.
9. Activate the BA database and update the XML.

Step by Step

1. On the **Navigation Pane**, click **Administration > Application Setup > General > Business Analytics Setup**.
2. In the **Name** field, click the **AssistButton**.
3. Press **F3** to insert a new row.
4. In the **Code** field, enter "Sales."
5. In the **Name** field, enter "Sales."
6. With the Sales database selected, click **BA Database>Overview**.
7. Click the **Cube** line.
8. Click **Functions > New**.
9. Click **Yes** to create a new cube.
10. In the **Name** field, type "Sales."
11. In the **Fact Table ID** field, enter "379."
12. Press **TAB** or **ENTER**.
13. In the **BA Db. Cube Card** window, click **Cube > Related Tables**.
14. Click **Select Fields**.
15. Select the **Selected** check box for **No. 9**, Customer No.
16. Click **OK** to close the **BA Field Selection** window.
17. Close the **BA Db. Cube Table Relations** window.
18. Click **Cube > Dimensions**.
19. Click **Functions > Select Fields**.
20. In the **Customer** tables fields, select the **No. 35**, Country/Region Code check box.
21. In the **Detailed Cust. Ledg. Entry** tables, select the **Selected** check boxes for the following:

   * **No. 3**, Entry Type
   * **No. 4**, Posting Date
   * **No. 5**, Document Type
   * **No. 9**, Customer No.
   * **No. 10**, Currency Code
   * **No. 12**, Source Code

22. Click **OK** to close the **BA Field Selection** window.
24. Click **Cube > Measures**.
25. Click **Select Fields**.
26. Select the **Selected** check boxes for the following:

   * **No. 7**, Amount
   * **No. 8**, Amount (LCY)
   * **No. 16**, Debit Amount
   * **No. 17**, Credit Amount
   * **No. 18**, Debit Amount (LCY)
   * **No. 19**, Credit Amount (LCY)
   * **No. 39**, Remaining Pmt. Dsc. Possible

27. Click **OK** to close the **BA Field Selection** window.
29. In the **BA Db. Overview** window, expand the Dimension line.
30. Click the Country/Region line and click **Card**.
31. In the **Field Numbers** field, click the **AssistButton**.
32. Select the **Selected** check box for **No. 2**, Name.
33. Click **OK** to close the **BA Field Selection** window.
34. Close the **BA Db. Dimension Card** window.
35. In the **BA Db. Overview** window, in the **Name** field, click the **AssistButton** to open the **BA Databases** window.

36. For the SALES database, click to insert a check mark in the **Active** check box.

37. Click **Functions > Update XML**.

38. Close the **BA Database** and **BA Db. Overview** windows.
Additional Business Analytics Tasks

Business Analytics enables some additional tasks that enable you to manage your analysis, including:

- Creating virtual cubes out of existing cubes. These can be used for further calculations and comparisons.
- Map existing dimensions to a new cube. This enables you to use existing dimensions when they already describe the data you need.

Demonstration: Set up a Virtual Cube

If several cubes have been specified in a configuration, for example a sales and a budget cube, a virtual cube can also be created that combines these two cubes for comparison purposes. Or, to create a data cube that includes unrelated tables, set up separate cubes for the tables, and then the cubes can be combined into a virtual cube.

Before creating virtual cubes, the cubes that are to be included in the virtual cube must be defined. At least two cubes must be combined, but an unlimited number of cubes can be included in a virtual cube.

Setting up a virtual cube is similar to setting up a regular cube, except it is not necessary to stipulate values for the Table Relations, Dimensions, Measures, and Functions because they have already been identified.

To set up a virtual cube, follow these steps:

1. On the Navigation Pane, click Administration > Application Setup > General > Business Analytics Setup.
2. Ensure that the appropriate BA database is selected.
3. Click the Virtual Cube line, and then click Functions > New.
4. Click Yes to create a new virtual cube.
5. In the **Cube Line No.** field, click the **AssistButton**.
6. Select a cube from the list, and click **OK**.
7. Repeat steps 5-6 to add another cube to the virtual cube.

**Demonstration: Map Existing Dimensions to a Cube**

If you already have defined an appropriate dimension for a cube dimension, you can add that dimension to a new cube.

The steps to map existing dimensions to a cube are as follows:

1. In the BA Db. Overview window, expand the Cube list, and click to select the cube you want to add a dimension to.
2. Click the **Card** button. The **BA Db. Card** window opens.
3. Click **Cube>Dimension**. The **BA Db. Cube Dimensions** window opens.
4. Click **Functions>Select Dimensions**, and select the dimension you want to add to the cube from the list. You can also create a new dimension, and then add it to the existing cube.
Summary

The process of creating your own OLAP cubes has raised a number of terms related to Business Intelligence. While this chapter has concentrated on using the Microsoft Dynamics NAV analysis software Business Analytics, the concepts described here -- OLAP cubes, Data Mart, Measures, Dimensions, Fact Tables -- are inherent to any Business Intelligence analysis you might perform using other applications, including SQL Server 2005.

Being able to create your own cubes enables you to set up a multi-dimensional view of your data, which in turn enables numerous ways to configure data to gain insights that simple two-dimensional analysis cannot provide. BA is one of many applications that can enable this, but has the added benefit of being part of Microsoft Dynamics NAV. The Advanced version of Business Analytics enables users to make calculations, add charts to the data view, and create reports. Business Analytics Advanced requires some setup that is covered in the course, Business Intelligence for IT Pros in Microsoft Dynamics NAV 5.1. However, in the next chapter, you will import the cubes you have now created into Microsoft Excel to perform some analysis there.
Quick Interaction: Lessons Learned

Take a moment and write down three Key Points you have learned from this chapter:

1. 

2. 

3. 