REPORT

Microsoft Dynamics™ NAV*

Reporting Tools

Technical White Paper

This paper presents options for the analysis and reporting of Microsoft Dynamics NAV 4.00. The benefits of certain processes and products are discussed as well as relevant issues partners and users should consider when debating the merits of each option. When necessary, products and their usages have been described to show the versatility of Microsoft Dynamics NAV through end reporting.

Date: March 2006

* Microsoft Dynamics NAV, formerly Microsoft® Business Solutions–Navision®

www.microsoft.com/dynamics/nav

Microsoft Dynamics™

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Introduction

One of the competitive advantages Microsoft Dynamics NAV has in the ERP market is its ability to provide reporting solutions for users. By combining Microsoft Dynamics NAV with other options offered by Microsoft or by building/customizing new solutions, Microsoft Dynamics NAV can provide an effective ERP solution. The following whitepaper describes how this is done. Options for analysis and report building, possibilities for customization, and an outline of various packaged solutions are presented.

What Is Analysis with Microsoft Dynamics NAV?

Analysis and reporting capability provided by an effective IT solution is essential to the success of any company in the modern business world. Microsoft Dynamics NAV has worked to ensure that users can perform analysis and reporting tasks with the aid of other products such as Microsoft Excel, products produced by other companies, and customized solutions. Valuable qualitative and quantitative tools, as well as other products that otherwise aid in the transfer of data, are outlined in this document.

Microsoft Dynamics NAV's Built-in Capabilities

Built into Microsoft Dynamics NAV are some capabilities for analysis and reporting. These are described in the following sections.

Standard Reports

Standard reports are delivered with Microsoft Dynamics NAV. There are more than 300 reports covering Sales and Marketing, Finance, Manufacturing, and so on. In this whitepaper we will not go into detail about which reports are available in the product, because these vary from country to country and depend on which granules are in the installation at hand.

Customer - Sales List
CRONUS International Ltd.

17. March 2006
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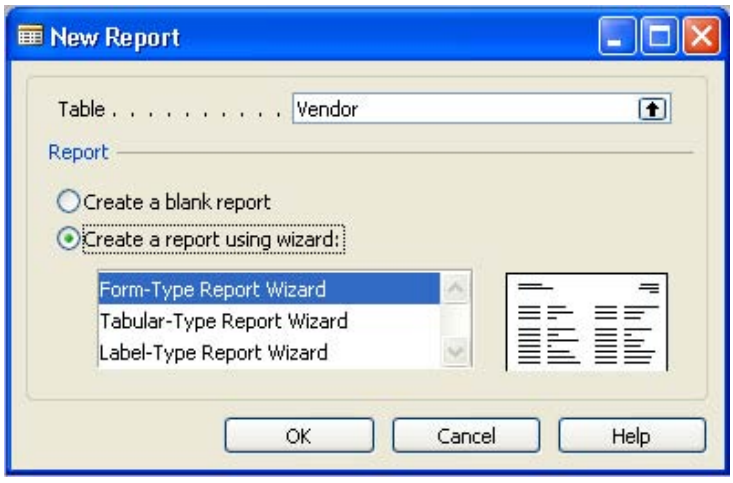
clausba

Amounts (LCY) greater than 0,00

No.	Name	VAT Registration No.	Amount of Sales (LCY)
01121212	Spotsmeyer's Furnishings Mr. Mike Nash 612 South Sunset Drive Miami, US-FL 37125 USA		0,00
01445544	Progressive Home Furnishings Mr. Scott Mitchell 3000 Roosevelt Blvd. Chicago, US-IL 61236 USA		1.499,02
01454545	New Concepts Furniture Ms. Tammy L. McDonald 705 West Peachtree Street Atlanta, US-GA 31772 USA		0,00

Report Wizard and Report Design Tools

When one of the more than 300 standard reports does not fulfill your needs, the Report wizard can help. With a Microsoft Dynamics NAV Report wizard, you can create simple reports based on tables in Microsoft Dynamics NAV. The wizard will guide you through steps that help them define the report. There are three wizards in Microsoft Dynamics NAV.



- **The Form-Type Report wizard helps you create a form-like report. You start by selecting a table to base the report on. After that, you decide which fields you want displayed in the report. Separators and column breaks can be inserted between fields in the report.**

After the content of the report has been defined, you can sort data in the report by selecting any of the indexed fields. The report has a header section that contains the company name, report name, date of execution, user ID, and page numbers.

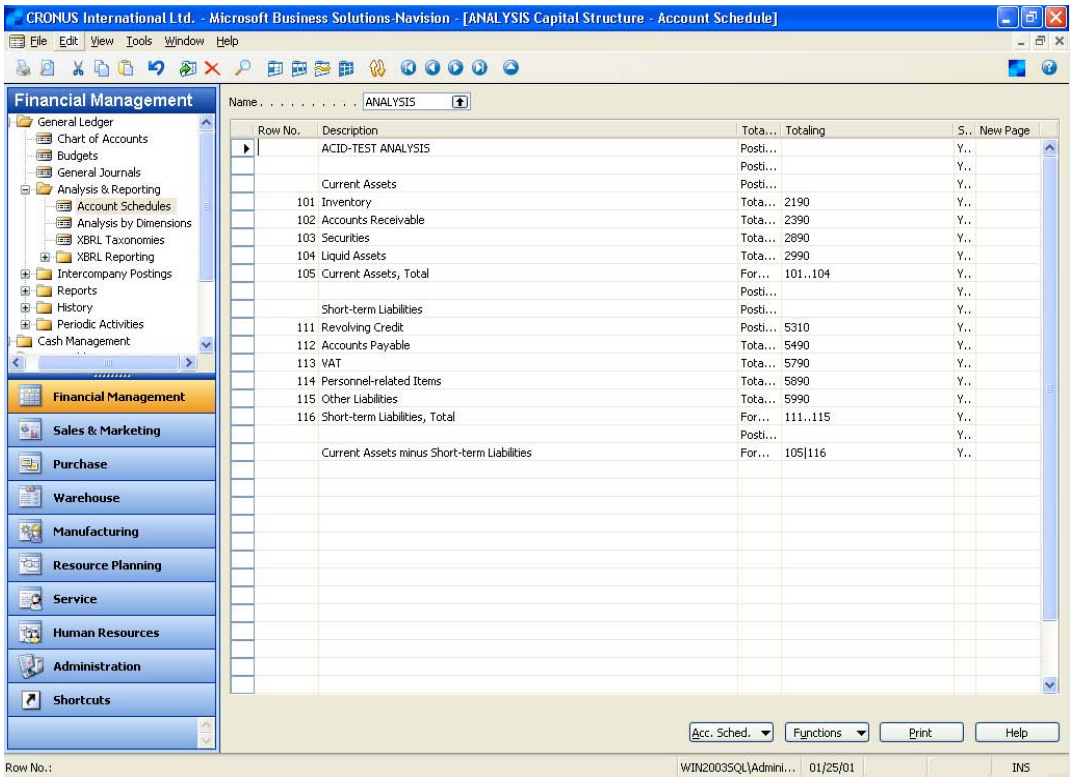
- **The Tabular-Type Report wizard helps you create a tabular report. You are guided through steps that include selection of fields, sorting of data, grouping of data, and creation of totals. You can also select a style to apply to the report: List style gives a table-like report, and document style uses a page header and gives a document look to the report.**
- **The Label-Type Report wizard helps you create a report that can be used to print labels. You are guided through the steps of selecting fields to be included in the report and specifying the layout of the report (including specifying how many labels to print across the page as well as the indentation, distance between labels, and label size).**

The wizards cover a variety of user needs and can be modified by adding more tables to data items, more fields to sections, more sections, and trigger code to sections in the reports. This means that the wizards can serve either as a help for creating quick ad-hoc reports or as a starting point for creating more advanced reports.

Account Schedules and Analysis Reports

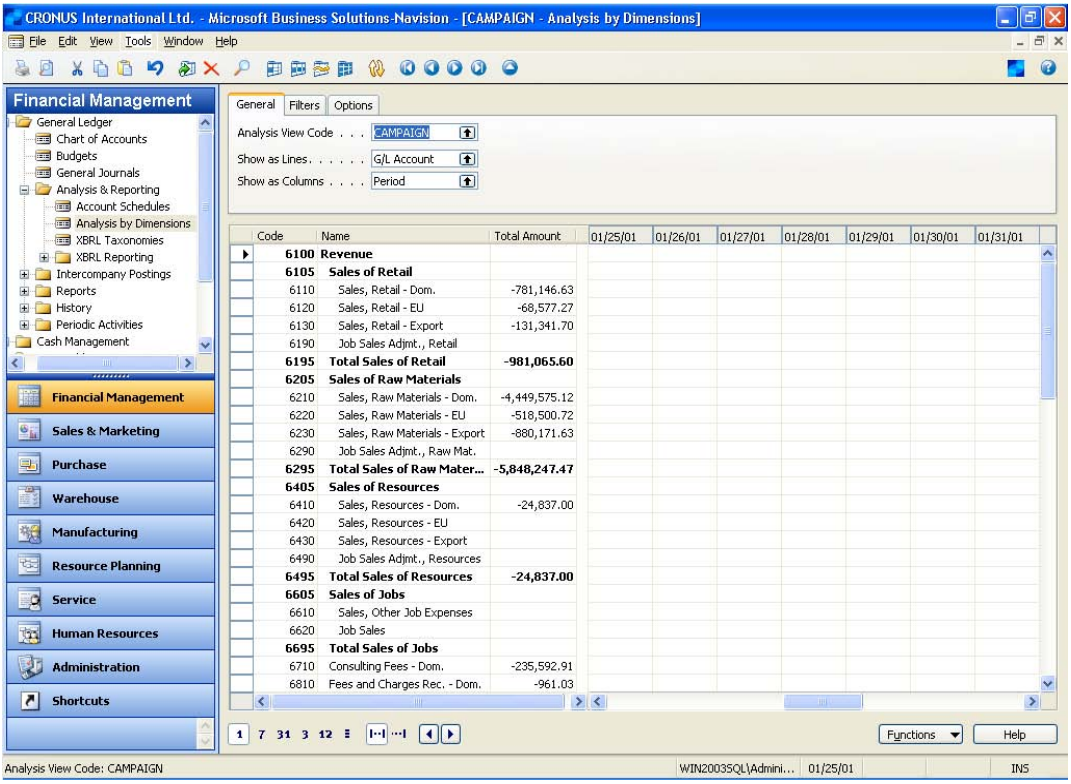
These are built-in analysis tools that allow you to slice and dice data from Salesperson, Customers, Vendors, Items, G/L, Sales, Purchase and Inventory. You can compare data to budgets across time, departments, project, campaigns, and other dimensions. The easily defined line and column layout gives you a comprehensive and tabular form of analysis. You can define lines as the contents of accounts, text, or freehand calculations across other lines in the view. Columns are defined in a similar way. They can contain data from accounts including Net Change from G/L Entries as well as Budgets. They can also be defined as calculations between other columns in the view. All in all, this provides you with the ability to tailor the analysis of data.

The results can be presented in print, in a window that allows easy navigation to original entries and documents, and/or in Microsoft Excel for further processing. Exporting the data to Excel disconnects it from data in Microsoft Dynamics NAV, so that changes to a record in Microsoft Dynamics NAV will not affect the data in the analysis. This also means that the sheet can be distributed as a regular file, and viewing the data in the sheet does not require access to Microsoft Dynamics NAV data.



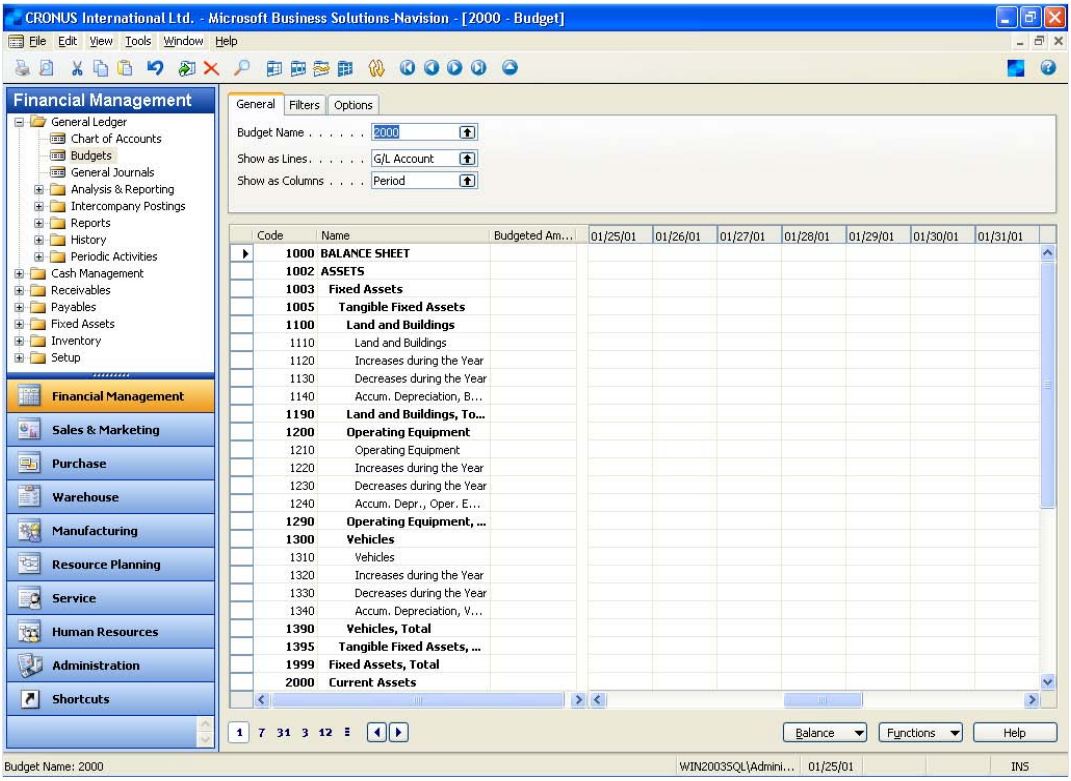
Analysis by Dimensions

This is Microsoft Dynamics NAV's built-in multidimensional analysis tool that allows you to analyze data from G/L, Purchase, Sales and Warehousing. In this tool, different analysis views can be created for different purposes. You can create views as cross tabs between dimensions including time. For example, you can create an analysis view relating to sales in a particular area for a particular time period and for a particular group of customers. The views can be saved for later use and can be sent to Excel at the click of a button, whereby the automatic creation of relevant pivot tables allows the use of such functionalities as dragging and dropping fields as well as the use of additional measures, dimensions, and filter criteria. To reflect changes in the database, you must update the views. This means that the data in the views are disconnected from the transactional data. When a record is updated in Microsoft Dynamics NAV, it remains unchanged in the view and, if it is exported to Excel, this view is also unchanged in the pivot table. The Excel sheets can be distributed as regular files. Viewing the data in a sheet does not require access to Microsoft Dynamics NAV data.



Budgets

Working with budgets in Microsoft Dynamics NAV lets you view budgets in a cross tab view. Budgets can be displayed with dimensions in rows and columns. The view can be filtered by any dimension and compared with G/L Account Balance and G/L Balance. Budgets can be copied to new budgets and manipulated and saved. You can export budgets to Excel, manipulate the data in Excel, and then import the data back into Microsoft Dynamics NAV.



Extracting Data from Microsoft Dynamics NAV

XMLPorts

XMLPorts are used to create XML documents from Microsoft Dynamics NAV data. Once it is in XML format, the data can be sent to and read by another application. New XMLPorts can be created for any documents that you want to exchange, such as a purchase order or a price list. The procedure has been simplified using XML input/output (I/O) functionality. Previously, enabling XML document exchange required a considerable amount of C/AL code, but now XMLPort objects can be designed effortlessly, making regular document exchange across different platforms and databases straightforward. XMLPorts can also be used to create a Microsoft Dynamics NAV database based on an XML document.

With the XMLPort Designer, Microsoft Dynamics NAV data can be placed as specific elements in the XMLPort during the XMLPort creation process. It is also possible to map elements and attributes in an XML document, making transferring data from one format to another uncomplicated and seamless. This functionality not only makes document exchange more straightforward, it also ensures that Microsoft Certified Partners can map data between Microsoft Dynamics NAV and a particular XML document through XML document exchange. This improves the overall performance of Microsoft Dynamics NAV for you. XML data can also be mapped to C/SIDE tables, fields, and variables. Developers can use code to manipulate XML data during the import/export process, ensuring the best result. Using XMLPorts as a means of exporting data gives the ability to execute code-delivering data in XML, which can be consumed by Reporting Services 2005 with the XML processing extension and by Reporting Services 2000 with a custom data processing extension, DTS/SSIS, and other tools.

NODBC

The Microsoft Dynamics NAV ODBC Driver (NODBC) provides maximum interoperability between the application and database as a single application. It can access any ODBC-enabled database by simply being configured to use its ODBC driver. In turn, an ODBC-enabled application can access a given database using its ODBC driver. This connection gives access to a specified company, so at least one connection per company is necessary, and NODBC only works against the native database. The ODBC driver manager acts as the common interface that enables this dynamic switching to take place, giving application developers database-independence. Two of the strong points of NODBC are that it gives access to flow fields and that it enforces Microsoft Dynamics NAV security. A downside of NODBC is that it is single-threaded. This means that using it in conjunction with Reporting Services is not recommended.

SQL Server

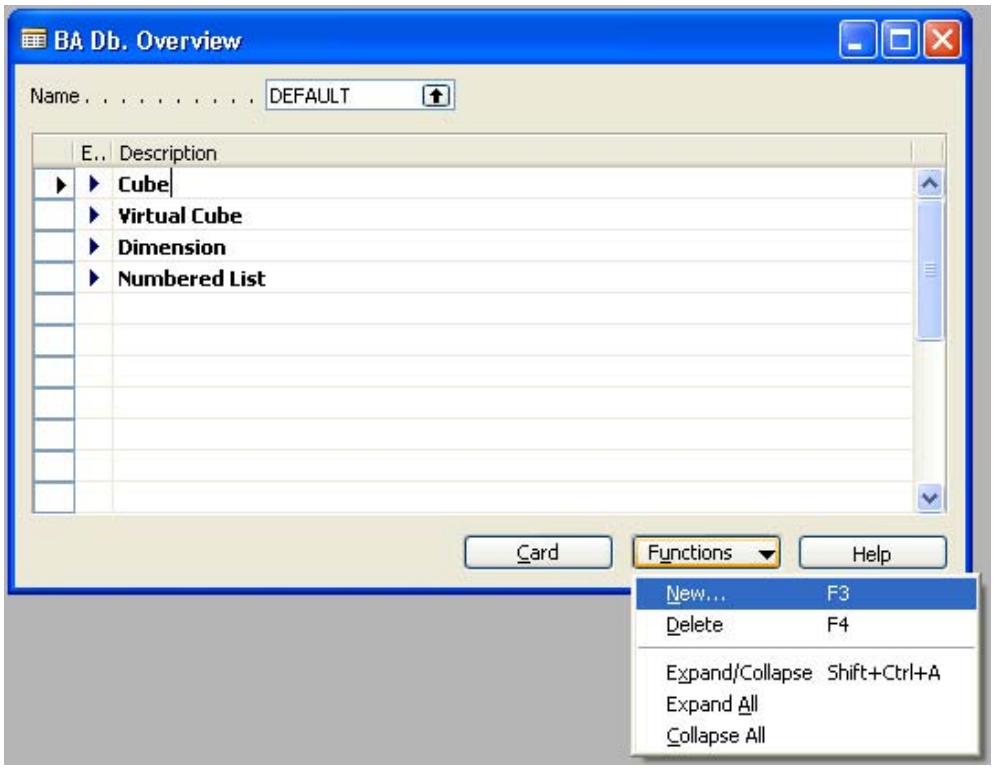
If Microsoft Dynamics NAV is running on SQL Server, data can be accessed directly in SQL. There are some caveats about doing this. First of all, security will have to be maintained in the SQL database. On top of this, you have no access to business logic when accessing data residing in SQL Server, and there is no access to flow fields when doing so, either. That said, this solution enables the use of Reporting Services and – if running SQL 2005 – the use of Report Builder. This will be described later in this paper.

Business Analytics

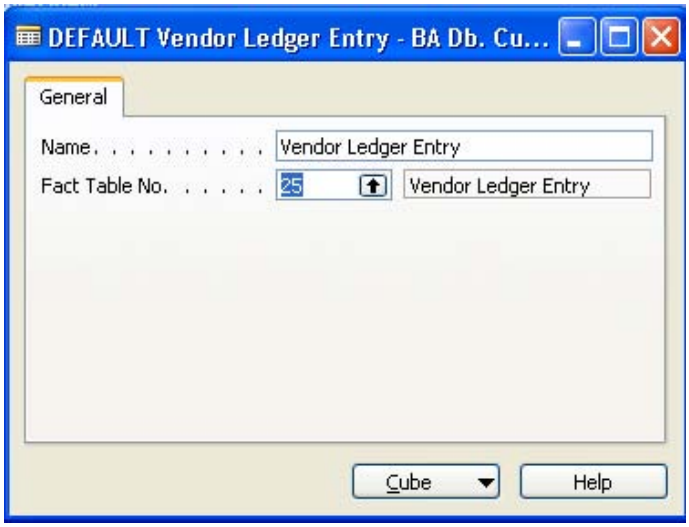
Business Analytics is made up of two separate granules: Basic, which adds the possibility for Microsoft Dynamics NAV users to define and create cubes in SQL Server 2000 Analysis Services, and Advanced, which add a comprehensive frontend to Business Analytics. It is also important to keep in mind that Basic is a prerequisite for using Advanced since this requires access to cubes built through the Basic functionality.

Business Analytics Basic

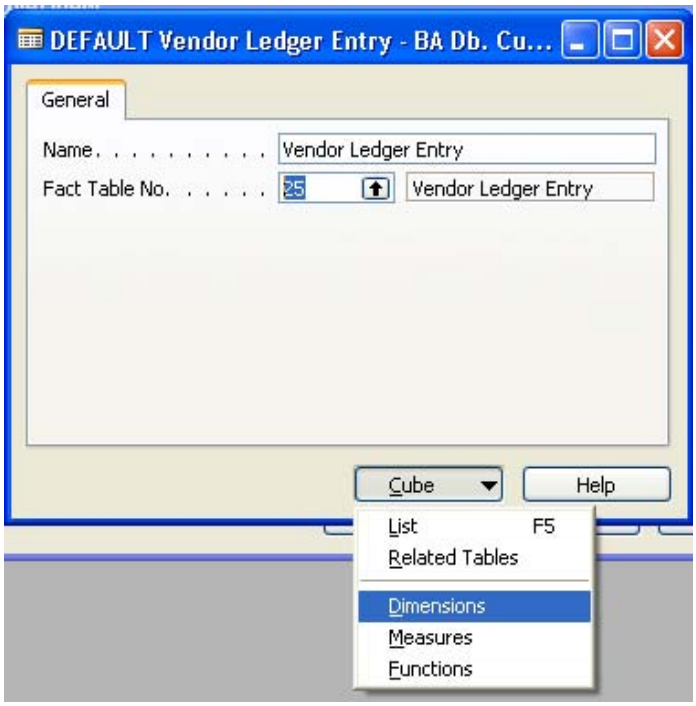
In the Basic setup, you can create cubes in Analysis Services based on data coming from Microsoft Dynamics NAV. For example, you can create a cube based on Vendor Ledger Entries:



1. Add a new cube by marking the cube entry and pressing F3.



2. Select the fact table that is relevant for the cube. In this case, Table 25.



3. Click Cube and add Measures (Facts), Dimensions, and Functions as needed.

When the cube has been defined, the configuration can be deployed. If you do this from inside Microsoft Dynamics NAV, any existing solution will be deleted and the new one created in its place. It is possible to maintain two active configurations by working with the SQL tools directly. This is described at http://blogs.msdn.com/clausba/ (this is not an out-of-the box functionality of the current release).

To be able to use cubes created in Business Analytics Basic in conjunction with Business Scorecard Manager, it makes sense to create Measures that cannot be created directly from Microsoft Dynamics NAV. To do this, it is necessary to use the tools provided with Analysis Services. This is described at: http://blogs.msdn.com/clausba. An example of a measure that makes sense in conjunction with Business Scorecard Manager is Gross Profit Margin. The Multi Dimensional Expression (MDX) for the measure looks something like this:

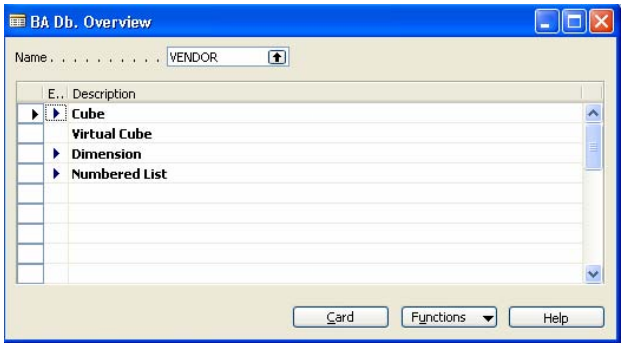
```
(SUM(CROSSJOIN({[G_L Account].&[00016100]},CROSSJOIN( {[G_L Entry Posting Date].currentmember},
{[Measures].[Balance at Date Amount]})))-
SUM(CROSSJOIN({[G_L Account].&[00017100]},CROSSJOIN( {[G_L Entry Posting Date].currentmember},
{[Measures].[Balance at Date Amount]})))
/
SUM(CROSSJOIN({[G_L Account].&[00016100]},CROSSJOIN( {[G_L Entry Posting Date].currentmember},
{[Measures].[Balance at Date Amount]})))
```

This can be done in the General Ledger cube in the default configuration in Business Analytics.

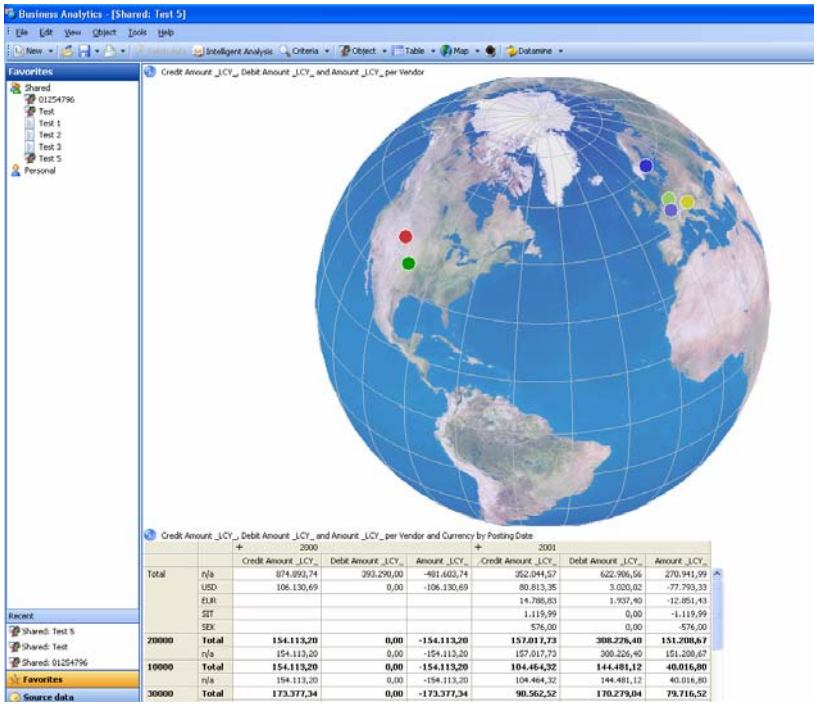
Business Analytics Advanced

Targit Business Analytics for Microsoft Dynamics NAV provides a strong analytical tool for customers. With Business Analytics, you can create a report and analysis based on data in a cube created in Microsoft Dynamics NAV. The cube contains measures and dimensions, which provide the skeletal

framework for Business Analytics analysis. From the Business Analytics Overview window, cubes can be created and configured in an XML format for further analysis.



Once the cube has been created in Microsoft Dynamics NAV, it can then be configured and utilized in Business Analytics. While analyzing the cube data, you can choose to create charts, graphs, globes, and maps, as shown in the following screenshot.



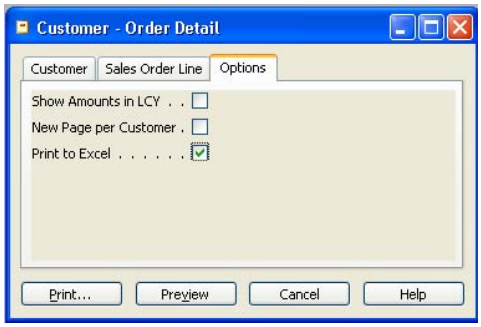
Several analysis views can be created at once, and you can add, edit, or delete information from the analysis or the analysis view itself at any time. These graphics can be later added to reports or be used as a stand-alone analysis, providing customers with a versatile and powerful analytical tool.

It is important to note that whenever a change has been implemented by executing the configuration from inside Microsoft Dynamics NAV, the installation program will have to be executed for Business Analytics Advanced to be able to access the cubes on Analysis Services. This is due to the fact that when executing the installation program security is set on the cubes and database allowing Business Analytics Advanced to access them.

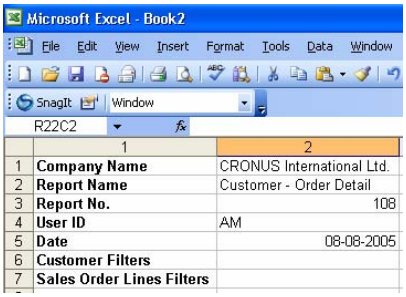
Microsoft Business Intelligence Tools

Excel

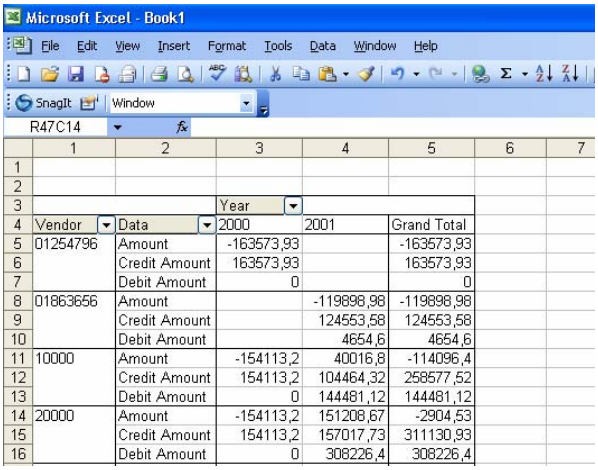
Microsoft's Excel software provides additional support for analyzing or reporting data maintained in Microsoft Dynamics NAV, creating a convenient and flexible resource for analysis and reporting tasks. To access this functionality, data from Microsoft Dynamics NAV is transferred to Excel for further analysis or reporting purposes.
The following example shows how you can take a closer look at a customer's order details. In Microsoft Dynamics NAV, open the Financial Management menu and then click Receivables → Reports → Customer - Order Details. On the Options tab, select the Print to Excel option, indicating that this data will be used for further analysis.



The information is then sent to a Microsoft Excel document for future use.



Excel can also be used in conjunction with Microsoft Dynamics NAV and Business Analytics. Once data has been created and configured in a Business Analytics cube, you can create pivot tables so the data can be analyzed in Excel.



	1	2	3	4	5	6	7
1							
2							
3			Year				
4	Vendor	Data	2000	2001	Grand Total		
5	01254796	Amount	-163573,93		-163573,93		
6		Credit Amount	163573,93		163573,93		
7		Debit Amount	0		0		
8	01863656	Amount		-119898,98	-119898,98		
9		Credit Amount		124553,58	124553,58		
10		Debit Amount		4654,6	4654,6		
11	10000	Amount	-154113,2	40016,8	-114096,4		
12		Credit Amount	154113,2	104464,32	258577,52		
13		Debit Amount	0	144481,12	144481,12		
14	20000	Amount	-154113,2	151208,67	-2904,53		
15		Credit Amount	154113,2	157017,73	311130,93		
16		Debit Amount	0	308226,4	308226,4		

The strength of Excel reporting with Microsoft Dynamics NAV is its flexibility – which is useful when tackling ad hoc tasks – coupled with the well-known user-friendly interface. Excel usability with the Microsoft Dynamics NAV and Business Analytics cube information provides you with another option for reporting and analyzing data maintained by Microsoft Dynamics NAV. These functions allow you to analyze data and review information in a practical fashion. An add-in, SQL Analysis Services for Excel 2002/2003, is available at this time. It gives the ability to create free-hand Excel reports on OLAP data sources and allows for more flexible reporting than pivot tables.

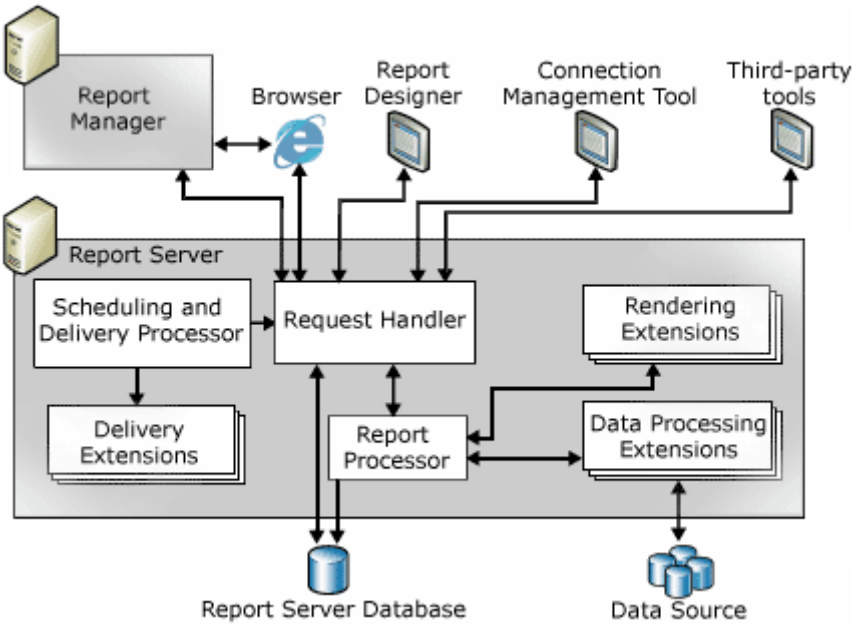
Reporting Services

SQL Server Reporting Services is a comprehensive, server-based solution that enables the conception, management, and delivery of both traditional, paper-oriented reports and interactive, Web-based reports. Reporting Services provides users with enterprise capable reporting and an environment for authoring, managing, and delivering reports to the entire organization. Additions included in Reporting Services in SQL Server 2005 provide extra enterprise reporting capabilities and allow business users to utilize data in an ad hoc fashion, generate their own reports from scratch, and share works with others. As an integrated part of the Microsoft business intelligence framework, Reporting Services combines the data management capabilities of SQL Server and Microsoft Windows Server with well-known and powerful Microsoft Office System applications.

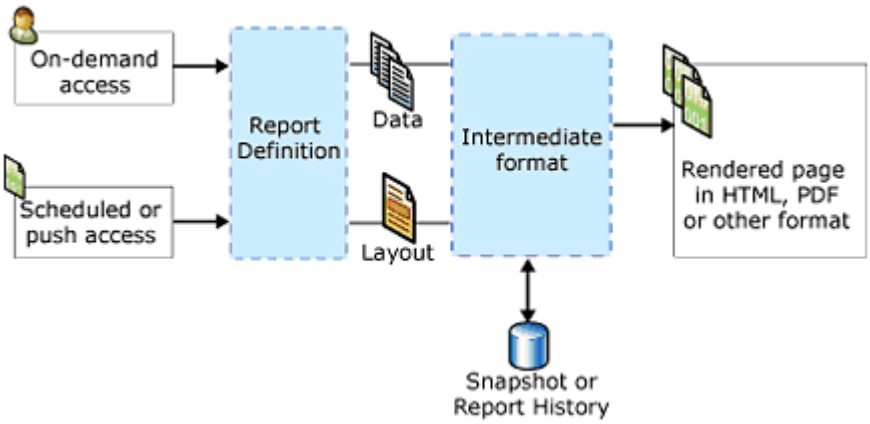
The functionalities of SQL Reporting Services itself are practical and enable you to create reports in a convenient manner. Reporting Services' report authoring functionality lets you create reports for publishing to the Report Server using Microsoft or other design tools that use Report Definition Language (RDL). Report definitions, folders, and resources are published and managed as a Web service with Reporting Services' report management functionality. Managed reports can be executed on demand or on a specified schedule and are cached for reliability and performance. Administrators can use the Management Studio to organize reports and data sources, schedule report execution and delivery, and track reporting history. SQL Server Reporting Services supports both on-demand (pull) and event-based (push) delivery of reports. You can view reports in a Web-based format or in e-mail. Security is also an issue addressed by SQL Server Reporting Services. Reporting Services implements a flexible, role-based security model in order to protect reports and reporting resources.

Reporting Services Architecture

Microsoft SQL Server Reporting Services is designed with a modular, distributed architecture to help achieve both scalability and flexibility. Processing is distributed across multiple components that can be integrated into custom solutions. The following diagram shows the Reporting Services architecture.



During the report creation process, a report definition is retrieved from the Report Server database and used with data from Microsoft Dynamics NAV to create a report. After the report has been created, it can be reconfigured into another format such as an Excel spreadsheet or HTML.
The following diagram illustrates how a report is processed.



Reporting Services was designed to meet a vast range of needs, including those of independent software vendors who may want to integrate reporting features into their tools and applications. Microsoft Dynamics NAV and Reporting Services can be easily integrated through modular design and extensive programming interfaces by software developers and enterprises so that reporting functionality works seamlessly. It has also been designed with a number of APIs so that developers can create custom extensions for reporting services.

The way Reporting Services accesses data depends on how Microsoft Dynamics NAV data is stored. If Microsoft Dynamics NAV is running on the native database, Reporting Services can access data using NODBC. If Microsoft Dynamics NAV is running the SQL option,Reporting Services can access data directly in SQL Server using the built-in provider. As mentioned earlier, because of the limitations of NODBC, SQL is the preferred solution in this scenario. This is due to the fact that NODBC is single threaded, limiting its use in a client/server setup. Also, as stated earlier, there are some caveats about accessing data directly in SQL Server. There is one caveat in accessing Microsoft Dynamics NAV data

this way. SQL Server does not store flowfields in the database. These are computed in Microsoft Dynamics NAV. For that reason reports that access data directly in SQL Server cannot access data from flowfields. Data security will have to be handled in SQL Server as the Microsoft Dynamics NAV security model does not accommodate accessing SQL Server directly.

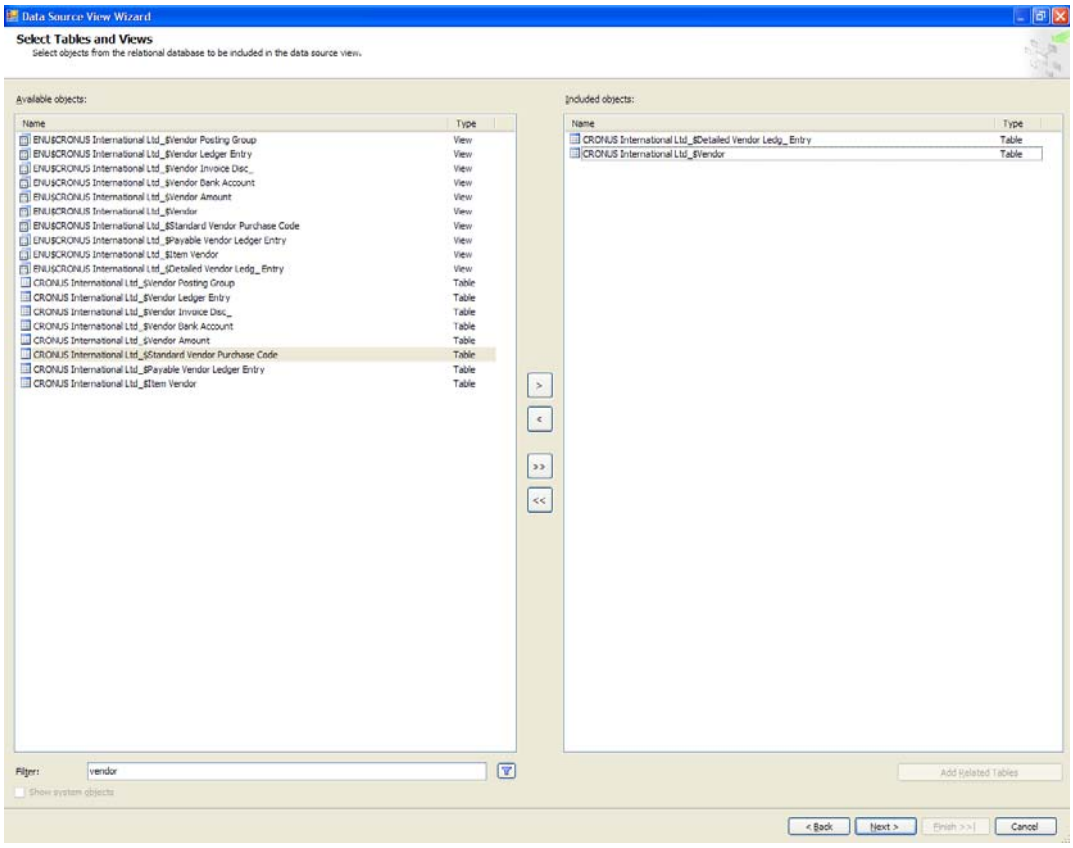
To create a report using Reporting Services, create a Reporting Services project. Add a data source pointing to the Navision database. Then add a Report and create a SQL query against the Navision database. When the query has finished running, you can design the actual report. After you have designed the report, it can be deployed to the Report Server and viewed in a browser.
It is important to note that reports created in Reporting Services with data residing in the Navision database run directly on the database. Thus they put a load on the same resources as regular usage of Microsoft Dynamics NAV.

A report pack with a set of sample reports running against the Navision database can be found at http://www.microsoft.com/sql/reporting. This package shows some of the capabilities of Reporting Services.

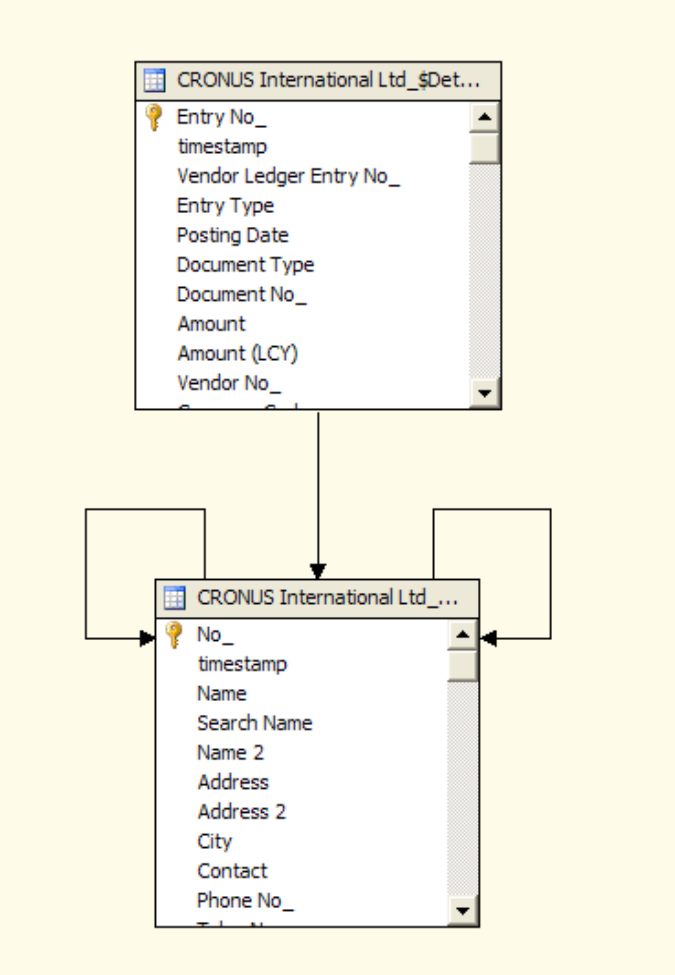
Report Builder

Report Builder is a feature that was introduced with SQL Server 2005. It lets you create reports by dragging and dropping fields from a semantic model built on top of the physical database. A prerequisite for using Report Builder is that Microsoft Dynamics NAV is running on SQL Server, because this is the only database that Report Models can be built on. The following procedure describes how to create a model on top of the Navision database and build a report on top of it.

1. Create a Report Model project in Business Intelligence Development Studio.
2. Add a data source that connects to the Navision database. Remember to set Security appropriately in the connection.
3. Add a Data Source View (DSV). The DSV needs to connect to the data source that you added in the previous example. In this example, the view is made up of two tables: Vendor Ledger Entry and Vendor.



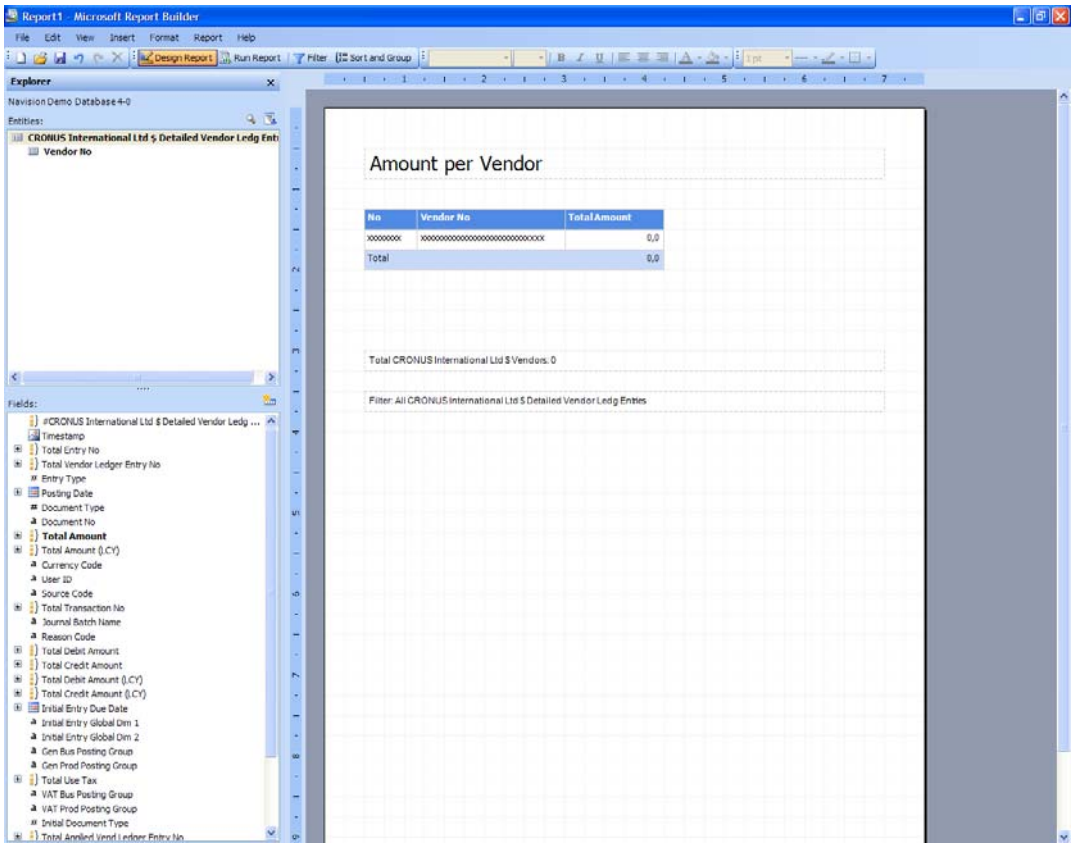
4. Open the DSV by double-clicking it.



This shows the relations, if any, between the tables in the DSV.

5. Populate the relations by clicking Database->Alter->Advanced tab.
6. To have Microsoft Dynamics NAV add relations to the database in SQL, select Maintain Relationships. This is a highly intrusive operation, so you should not be do this unless it is strictly necessary.
7. Add a report model based on the DSV that you have just created. If you use the default settings, a model is created based on the relations in the DSV.
8. After deploying the model on the Report Server, navigate to the Report Builder and select the model.

You can now create reports by navigating the model and dragging and dropping fields onto the report.



After you have selected the fields, you can add necessary filters, groups, and prompts to the report. The report can be saved back to the Report Server for later use.

Business Scorecard Manager

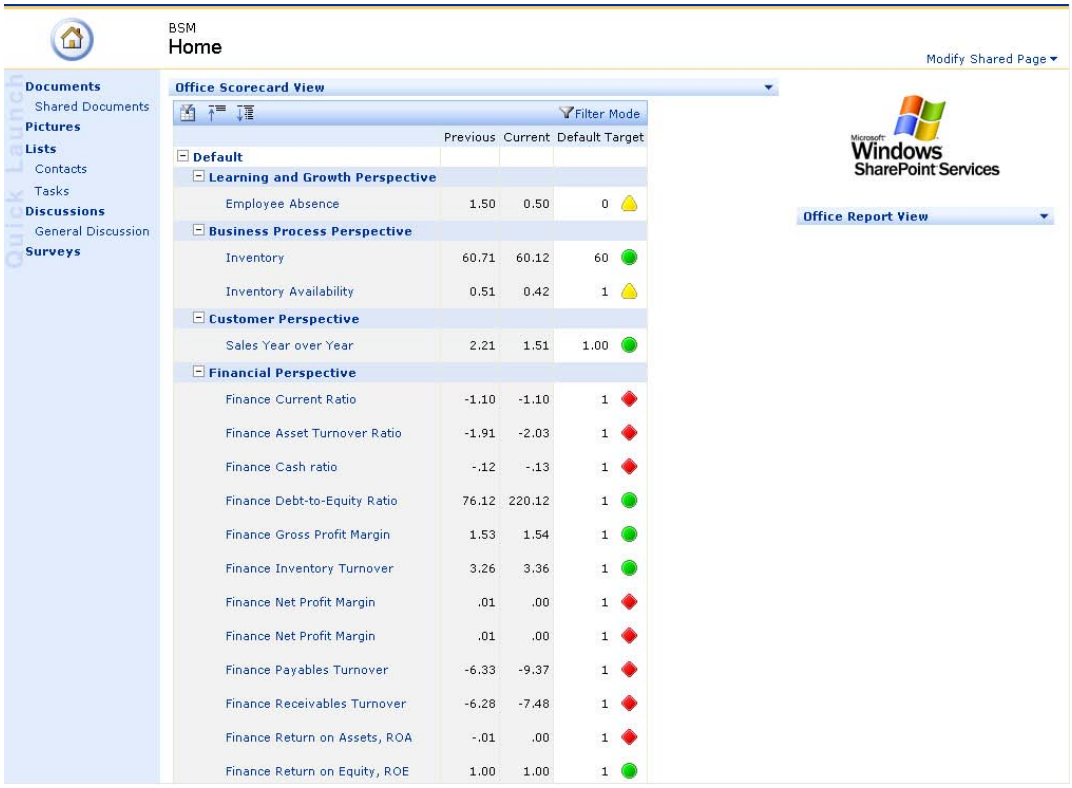
Business Scorecard Manager is a comprehensive scorecard and dashboard application that provides knowledge workers with deep contextual insight into business drivers. Information is delivered in a collaborative environment for effective business management and action in the performance-driven organization.
A Microsoft Office product, Business Scorecard Manager empowers employees to build, manage, and use their own scorecards, reports, and visual resources using familiar tools. With these tools, employees can analyze relationships between key performance indicators (KPIs) and tangible business objectives. Business Scorecard Manager gives companies a broad view of business opportunities, through which employees can better understand business challenges, effectively shape solutions, and quickly reach their objectives. Decision-making happens across all levels of an organization, and empowering employees with powerful business intelligence (BI) solutions can help them have greater impact.

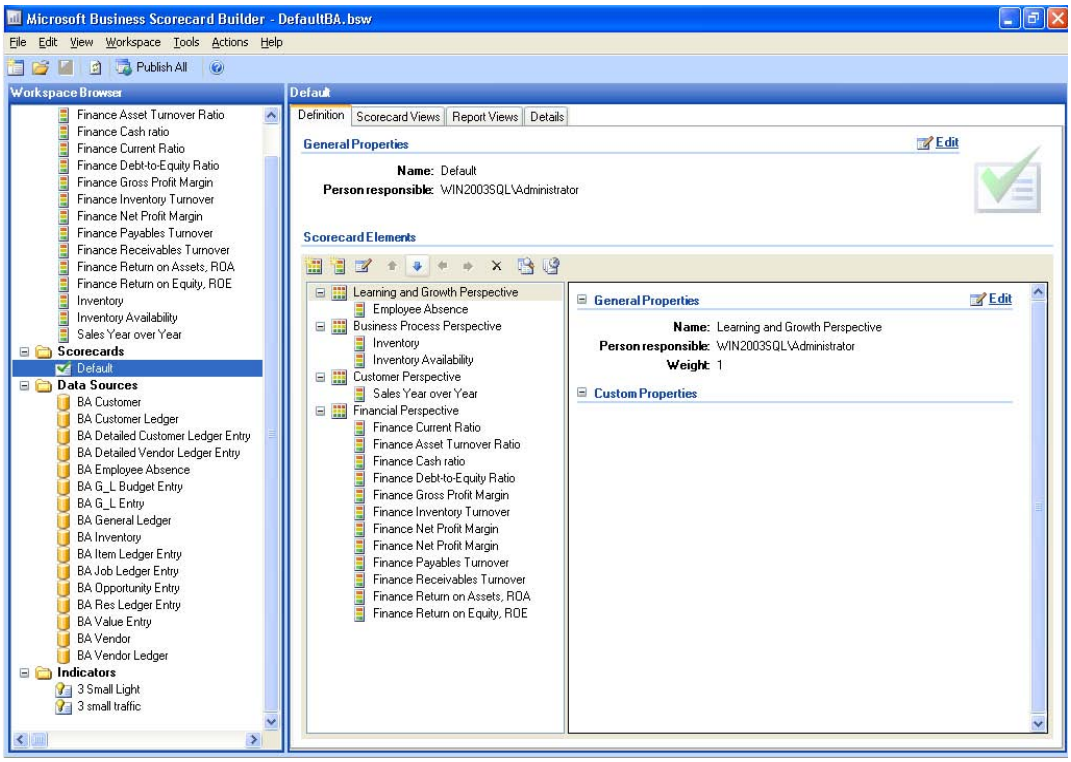
There are two ways to integrate Business Scorecard Manager with Microsoft Dynamics NAV.

- **One is to make use of the ability to build KPIs on top of relational data. This means that KPIs can be created directly on top of the Navision database. In this solution, it is important to keep in mind that since the scorecard is connected directly to the transactional database, there are two caveats. First, all queries will put a load on the Navision database, which can make the performance worse for the users of Microsoft**

Dynamics NAV. Second, data can be updated between views of the same scorecard, so that people may see different results even when looking at data at what seems to be the same time.

- **Another way of integrating Business Scorecard Manager to Microsoft Dynamics NAV is to connect the scorecard to cubes created with Business Analytics Basic. When you do this, the two caveats mentioned above do not apply. This means that measures like the KPIs mentioned earlier should be created to enable the creation of meaningful scorecards. To make this configuration run, the connection pool running the Scorecard Server must have access to the cubes in Analysis Services.**





Conclusion

Analysis and Reporting services are an important part of the enterprise resource planning process. Microsoft Dynamics NAV has been explicitly designed to give the user many options for optimal analysis and reporting, and to leave room for partners to provide customized solutions. With the correctly selected reporting tools and Microsoft Dynamics NAV, dependable and practical analysis and reporting is available and adaptable to individual users' needs.

Additional Information

For information about Business Intelligence Partner companies, please refer to:
http://www.microsoft.com/sql/partners/dwa/default.mspx

For more information about the Business Scorecard Manager, please refer to:
http://msdn.microsoft.com/isv/technology/bss/default.aspx
http://www.microsoft.com/office/bsm

For more information about the SQL Analysis Services add-in for Excel 2002/2003, please refer to:
http://www.microsoft.com/office/solutions/accelerators/exceladdin/default.mspx

For more information about Business Analytics Basic and Advanced please refer to
http://blogs.msdn.com/clausba

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Microsoft Dynamics, a division of Microsoft, offers a wide range of integrated, end-to-end business applications and services designed to help small, mid-market and corporate businesses become more connected with customers, employees, partners and suppliers. Microsoft Dynamics' applications optimize strategic business processes across financial management, analytics, human resources management, project management, customer relationship management, field service management, supply chain management, e-commerce, manufacturing, and retail management. The applications are designed to provide insight to help customers achieve business success. More information about Microsoft Dynamics can be found at www.microsoft.com/BusinessSolutions.