Paper 49-25

Leveraging Your ERP Investment with the SAS® System

Steven M. Sober, SAS Institute Inc., Denver, Co.

ABSTRACT

Around the world, thousands of companies have turned to enterprise systems for help in automating and integrating business processes. Yet few have experienced the full business benefits of exploiting enterprise information for enhanced decision-making power. In fact, many have invested vast sums of money in enterprise resource planning (ERP) implementations, only to find that enterprise information delivery is more difficult to achieve than ever.

As such systems become more prevalent, and as more resources and money are poured into their implementation, organizations are expecting to achieve a substantial return on their ERP investment. The question is -- are they getting it? Unfortunately, the answer is often "no."

INTRODUCTION

Many organizations are experiencing major problems when it comes to deriving useful decision support information from ERP systems. Because they are so complex and transaction-based, it is difficult for business users to get the flexible, timely reporting information they need for effective decision making.

For example, navigating the multiple table structures of SAP AG's R/3 systems often require specialized knowledge of ABAP, the SAP AG programming language. As a result, end users cannot easily get the information they need. This means a further backlog of IT requests for usable data, reports, and information. SAS® Intelligent Warehousing Solution can solve this information dilemma by warehousing ERP data (along with other data as needed), and providing end users with the different tools they need for exploiting the data.

The goal of this paper is to demonstrate how SAS® Intelligent Warehousing Solution can:
- Improve data access and exploitation
- Automate processes
- Increase efficiency
  - Documentation
  - Business User Applet
- Reduce duplicity and effort by
  - Establishing repeatable processes
  - Creating shareable business rules
- Provide better return on investment by providing applications to exploit ERP systems.

THE SAS INTELLIGENT WAREHOUSE

Not so long ago, the predominant trend for improving business operations was to move forward in a step-wise fashion, automating processes and creating customized systems according to their individual goals and characteristics. Then along came enterprise systems or enterprise resource planning (ERP) from providers such as SAP AG, PeopleSoft, and Baan. Enterprise systems were a revolutionary concept, requiring companies to rethink their way of operating. Unlike computer systems of the past, which were typically developed in-house with a company's specific requirements in mind, enterprise systems are off-the-shelf solutions. They impose their own logic on a company's strategy, culture, and organization -- often forcing companies to change the way they do business.

In time, organizations achieve massive efficiencies using standard applications such as SAP AG's R/3. But beyond a certain point, the marginal returns on these efficiencies will diminish, because all organizations will tend toward the same level of efficiency. By contrast, information about business processes, the organization's customers, the competitive environment, core competencies, and how best to deploy the organization's resources -- including the massive IT resources that run SAP AG systems -- is organization-specific and needs to be used creatively. If the organization does this, it can create sustainable competitive advantages for itself.

Some of the features that are key strengths of ERP systems such as SAP AG's R/3 are precisely the barriers that prevent them from being effective solutions for decision support. For example, the linkages that are central to process efficiencies make standard applications very ineffective for reporting. Wayne Eckerson, Vice President, Technology Services, at The Data Warehousing Institute, says, "No matter what ERP system you use, data should not be controlled by an ERP vendor. You want to use a warehouse as a lever to keep control over your data resources -- to keep your systems open."

The reason is that decision support requires maximum flexibility in the data structure. If you need to restructure data every time you query an ERP application, the wait times for a report become intolerable, even assuming that it is possible to get the information you want at all.

For example, retail companies need to examine sales trends to forecast the sales of different brands to different customers in different regions and countries over the coming months. They might also want to discover complementary goods, factors influencing buying behavior, and countless other linkages in the data. This is key to maximizing sales revenues, but you simply cannot do it effectively with data that is organized around individual transactions.

ERP systems are excellent if you want to find out the latest status of a sales order. But -- to see and predict trends, to make better decisions, to move from tactical to strategic -- companies need historical, time-stamped information. Companies need the SAS Intelligent Warehouse.

The SAS Intelligent Warehouse provides an end to end warehousing environment. It automates and rapidly integrates ERP data into your warehouse. SAS/Access® interfaces and SAS/Warehouse Administrator™ provided the backend architecture. While SAS/Publish™ and Subscribe, Enterprise Reporter™ and other SAS technologies automate the deliver of e-Intelligent.

As an example, let's look at the SAS Intelligent Warehousing for SAP AG's R/3 system. SAS Institute's new access engine for SAP AG's R/3 data combines with SAS data warehousing capabilities to open up R/3 data for full exploitation by users throughout an organization. With the SAS solution, R/3 data can be easily accessed, combined, massaged, and stored in a data warehouse. End users are then empowered to ask their own questions and get their own answers. Specialized data marts can be created.

As a result it becomes very easy for business users to get the data they need. Users can drill down into their data asking additional questions, users can perform multidimensional analyses -- they can turn their data all around to examine and explore it. Users across an organization can really get the

integrated enterprise information they are seeking -- and it is no longer a big headache for IT.

Another of SAS Institute's warehousing strengths is metadata integration, and indeed this is key to ERP data exploitation. The SAS/ACCESS interface creates views to R/3 data so you can immediately capture the data you need. Metadata about the views is exported to SAS/Warehouse Administrator software, which creates operational data definitions (ODDs).

When the ODDs are defined, a detail data table is created in the SAS Data Warehouse. From there you can create summary databases, multidimensional databases, and other data sets. You set up your exploitation tools to run on top of those -- and then you are on your way to true enterprise information delivery.

REAL WORLD EXPERIENCES

There have been many lessons learned by helping SAS customers around the world with installations of SAS Institute's new Intelligent Warehousing Solution for SAP AG's R/3. We've found that business users at a number of sites are experiencing a great deal of frustration because they cannot get the information they need from their R/3 systems. We are seeing a lot of this frustration develop about a year into the ERP implementation. At that point, some legacy systems have been turned off. The data that end users need is now stored in R/3, and perhaps other data structures as well.

Unfortunately, because ERP systems, such as R/3, have such complex data structures, it is difficult for business users to access the data and get the information they need. The internal tables of R/3 are complicated and scattered. It is just not as simple as combining a couple of R/3 tables and getting the data you need. Even with a tool to read the data structures, end users don't know how to navigate the multiple tables of R/3. And what if they need data that is not contained in the R/3 system -- how are they going to access and combine data from other places?"

Let's look at how the SAS Intelligent Warehousing Solution can help simplify the task of turning ERP data into useful information by stepping through the steps required to build a SAS data warehouse from SAP AG's R/3 system.

## INFORMATION DELIVERY AND THE ETL PROCESS

To demonstrate we will be staging purchasing data that is stored in a SAP AG R/3 system. In this section we will concentrate on the ETL process. Our goal is to stage an OLAP cube for multi dimensional analysis of purchase order data. We would like to be able to answer questions like, Who are we buying from? What are we buying?
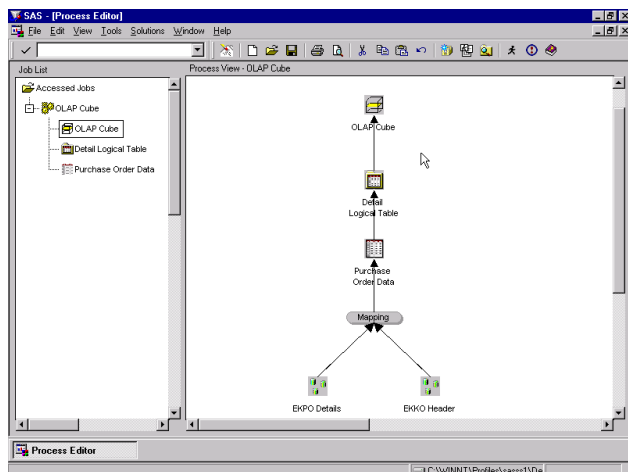

The first steps of the ETL process are to generate SAS views and export metadata about these views to SAS/Warehouse Administrator. SAS/Access interface to R/3 allows us to create and maintain SAS views. The views can be created against Cluster, Pool, Transparent, and View structures defined in R/3. These views may contain a where clause which is processed by R/3. To utilize the index defined in R/3 be sure to use all of the variables that make up the index in the where clause. If you do not do this, R/3 will sequentially scan the entire table. When saving the view you can also save the current state of the view i.e. selected columns and where clause. This information will be loaded into the interface the next time you select the R/3 table the view is accessing. You can also save the source code. The perfect place to store this source code is in the edit load step of the Operation Data Definition of the view in SAS/Warehouse Administrator.

Lets take a look at a few screen shoots to guide you through the process of generating one of the views. This view will contain selected columns and a data drive where clause.

To activate SAS/Access interface to R/3 enter the command %r3access.
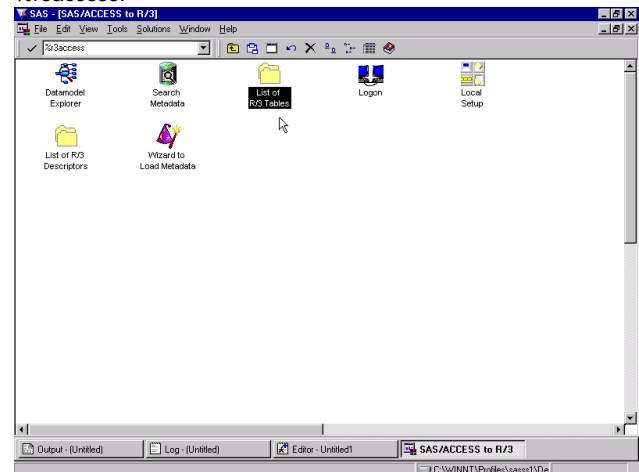
Because we know which structures in R/3 that we need to create views to we will be using the "List of R/3 Tables" icon. In our case we need views to EKKO and EKPO which are the purchasing header and detail tables and LFA1, MAKT, T001L, T001W, T023T, T0161T which are the look up tables for the encoded values found in the header and detail tables.
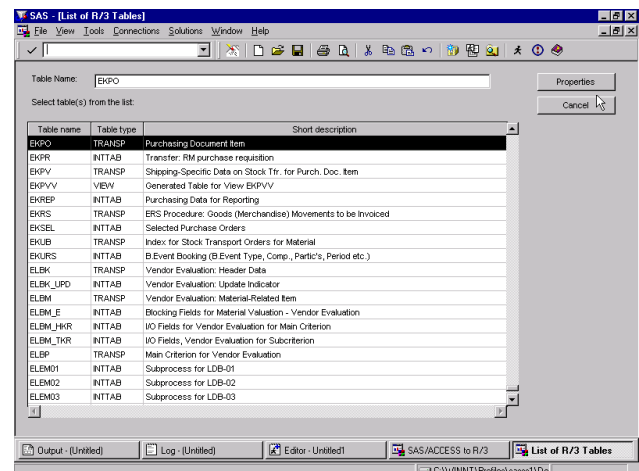
Once you have specified all of the R/3 structures, click on the push button "Properties". From this window you can change the view name and locations where the source code and R/3 descriptor are stored. Clicking on "More Properties" will allow us to select the columns as well as define any where clause criteria that is needed.
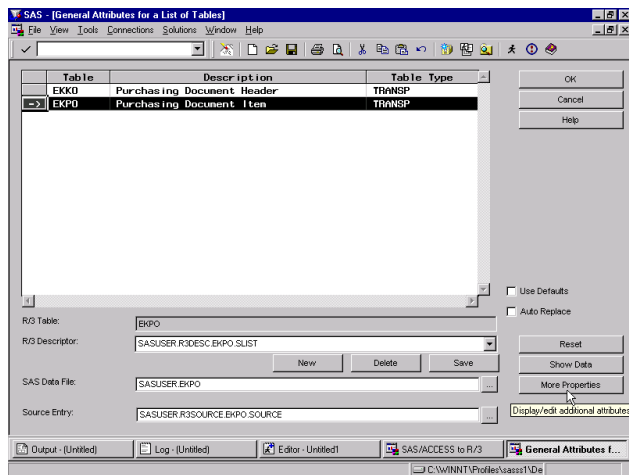

Typically the view contains the same column names that are defined in R/3. However, if you want to change the names used in the view you can do this here. By modifying the name and format for a column and clicking on "Apply". To select which columns we want defined to our view we click on "Select Fields". Notice that the primary keys for this R/3 table are MANDT, EBELN and EBEL and flagged with an "x" when building your where clause you need to know which fields are keys within the R/3 structure.
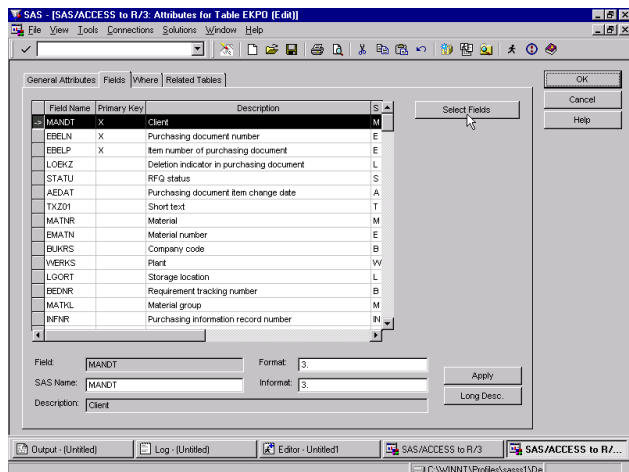
SAS/Access interface to R/3 utilizes the metadata defined in R/3. We can search by variable name, description or name and description. We can list the columns in the order they are defined in the R/3 structure as well as by ascending and descending text. This really simplifies finding the columns. Rarely is it necessary to include all of the R/3 columns in the view. Keep in mind you will achieve better performance by not choosing columns that are defined at the end of the structure.
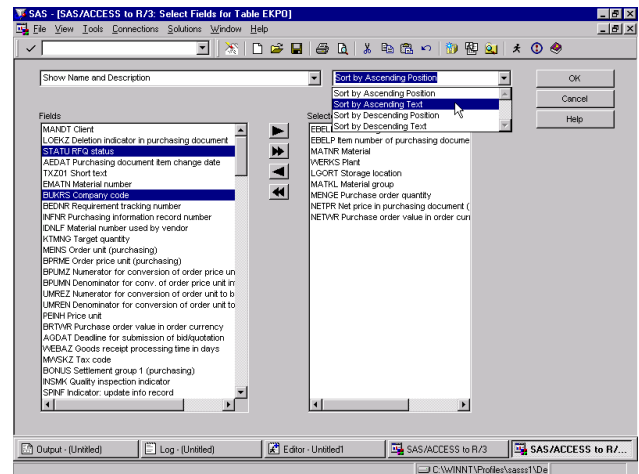

Now that we have the columns selected we can define a where clause for the view. By using the SAS/Macro facility we can generate data drive where clauses. As shown here with the macro variable &doc. Also keep in mind that R/3 will only utilize indexes of every column defined as an index is used in the where clause.
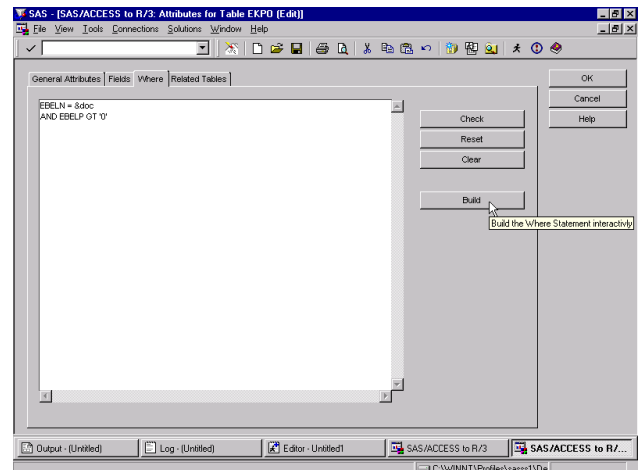

Once we are satisfied with the column selection and the where clause we can save the view, descriptor, and source code by using the action bar item "Tools".
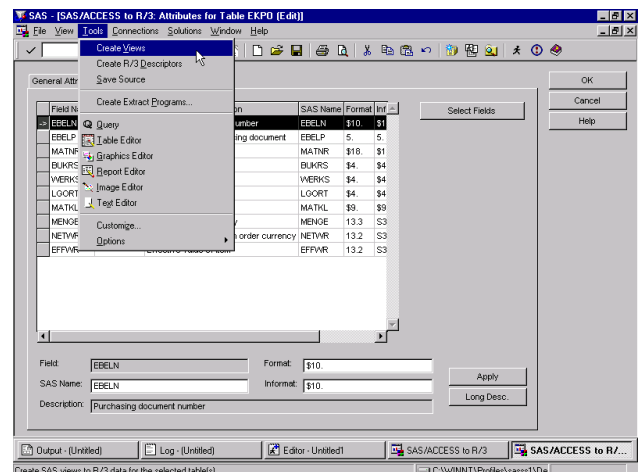
SAS/Access interface to R/3 is tightly integrated with SAS/Warehouse Administrator. This integration allows us to export metadata about this view to SAS/Warehouse Administrator.
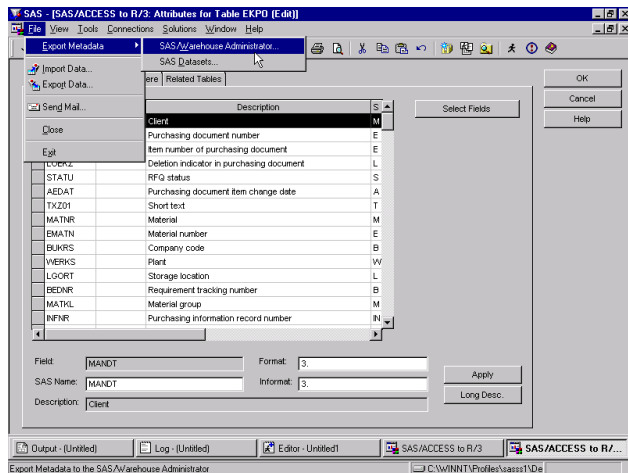
This step will create an operational data definition in SAS/Warehouse Administrator. To export the long documentation that are defined to the columns in R/3 check the corresponding check box prior to exporting. The long documentation becomes a note entry for the given column.
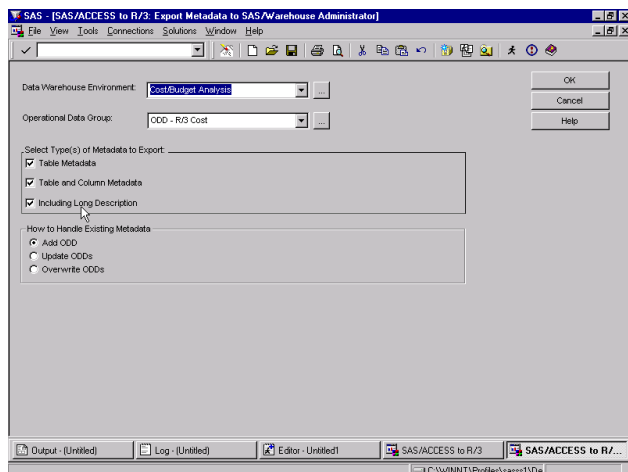

While SAS/Access interfaces provide a quick access to the data within your ERP systems it is SAS/Warehouse Administrator that provides a visual environment for managing data warehouses. Through its metadata, SAS/Warehouse Administrator provides a single point of control for managing

➢ data sources (on any platform accessible to SAS, in any format accessible to SAS)
➢ data stores (on any platform accessible to SAS, in any format accessible to SAS)
➢ Process Flows which define how data moves from sources to targets
➢ source code generated by SAS/Warehouse Administrator
➢ user-written source code retrieved from code libraries
➢ Addition and enhancement of metadata
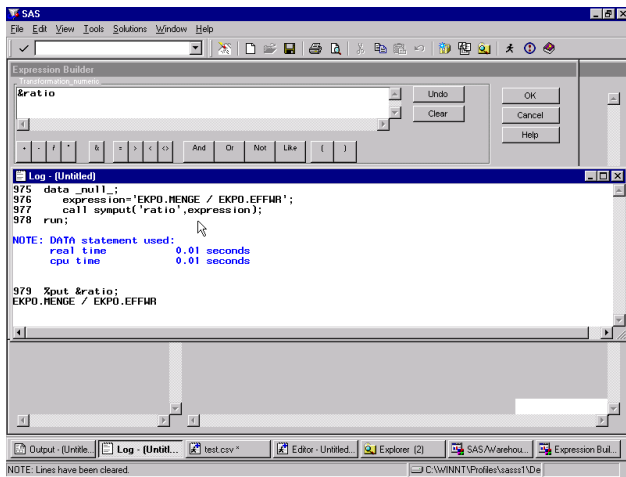➢ Jobs which execute the code that moves data from sources to targets.

When working with ERP data you need to do a lot of transformations to stage the data for loading into the warehouse. By customizing the components list used by the Expression

Builder window you can define SAS expressions which transform columns, provide conditional processing, calculate new values, assign new values, as well as utilizing user defined formats to handle lookups. To accomplish this you need to create the SAS data set _SASWA.WAXFORM by copying and modifying the SAS supplied components and expression data set SASHELP.WAXFORM.
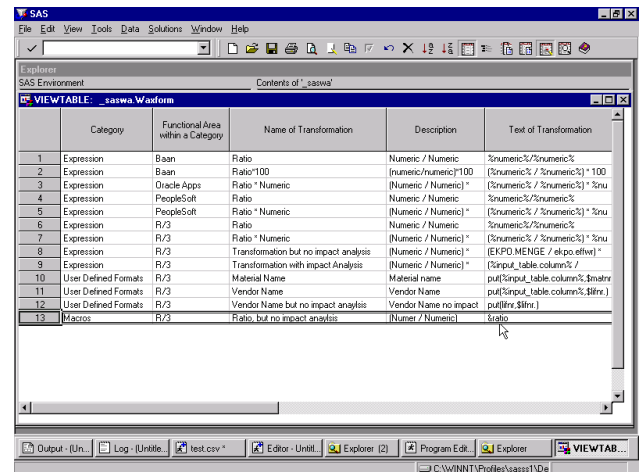

To access your user defined components and expressions you go to the properties of the mapping step and click on the Column Mapping tab. You then select the column you want to transform and click on the Derived Mappings push button. This will bring up the Expression Builder Window that contains the SAS supplied components as well as your customized components.

To replace the symbolic placeholder you would click on the component Input Tables, the table and then the column name.

A lot of the data stored in R/3 is encoded. Utilizing user-defined formats is one way to accomplish look-ups for the encoded data without merging multiple R/3 structures together.

To create expressions that will inherit future changes you can utilize the SAS Macro facility. This way you do not have to go to each process and change each usage of the expression. You simply change the macro value and the next time the job runs it inherits the new expression. This is a huge saving in code maintenance as well as an assurance that you have a single version of the truth.

Keep in mind that if you hard code the variable name within the text of the transformation you will loss the ability to report on it within the Impact Analysis add-in. To preserve this functionality you need to use symbolic placeholders within the text of the expression or user defined format.

IMPACT ANALYSES

To determine the impact configurations changes made in your ERP system have on the processes used to stage your warehouse, SAS/Warehouse Administrator comes with an add-in called Impact Analyses. To use this add-in you would right mouse click on the ODD effected by the configuration change. Choose Impact Analyses, and Detailed (tables & processes).
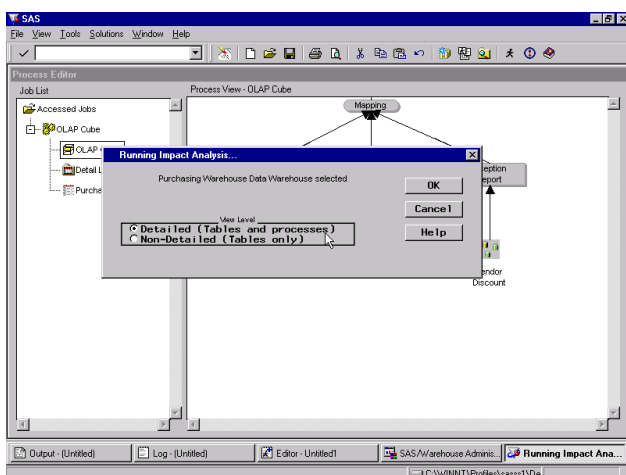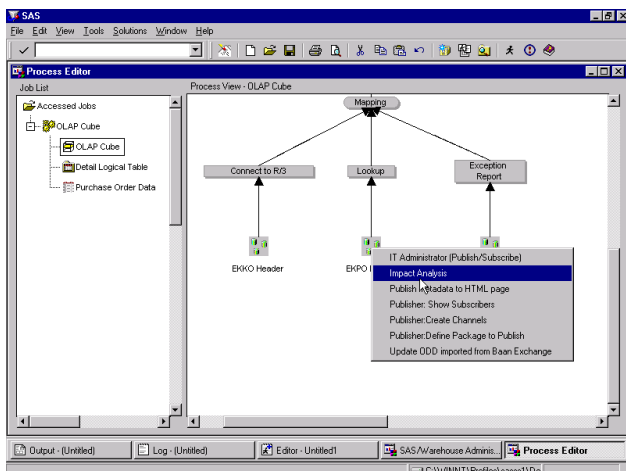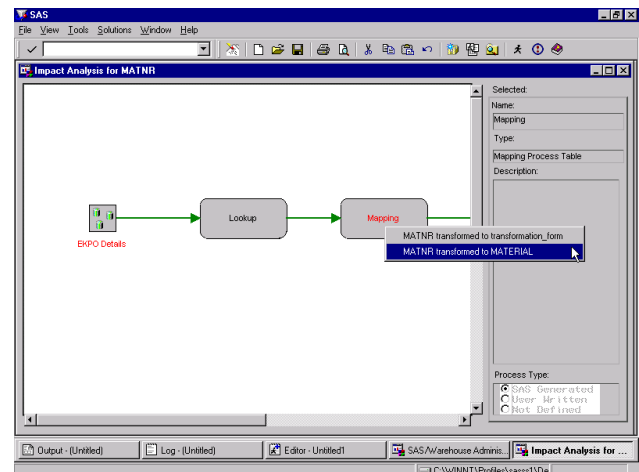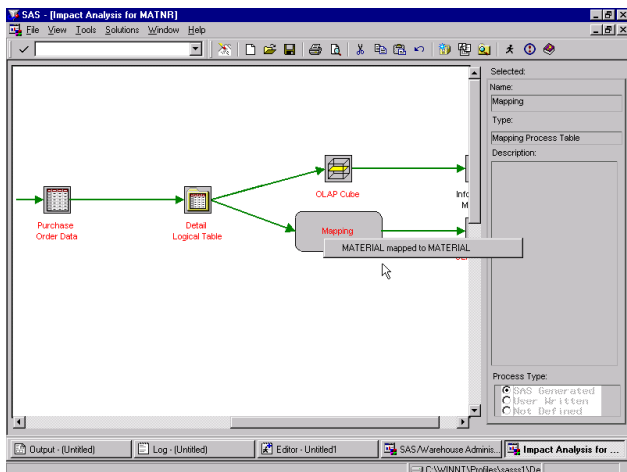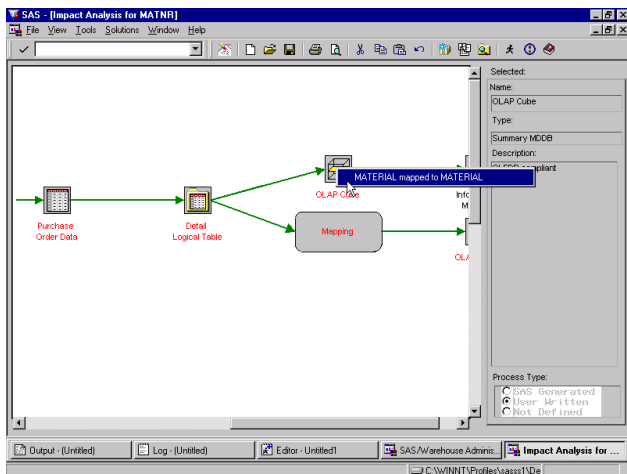

Let's see what impact would occur if the ERP team decides to make a configuration change to the column MATNR. By selecting

the variable MATRR from the ODD we are presented with a color-coded process flow diagram.
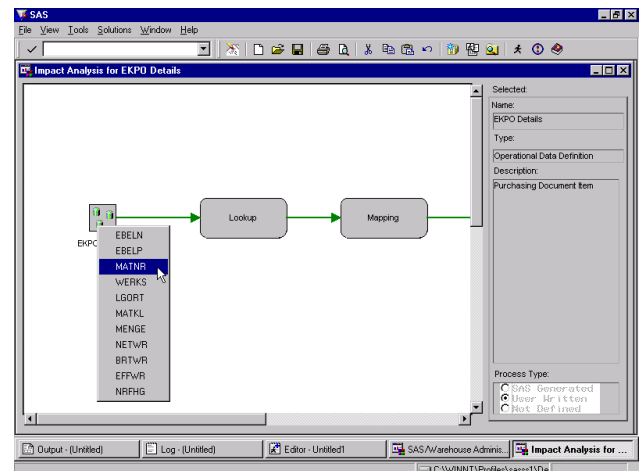
In this example there are 6 process/structures that are effected by this configuration change.
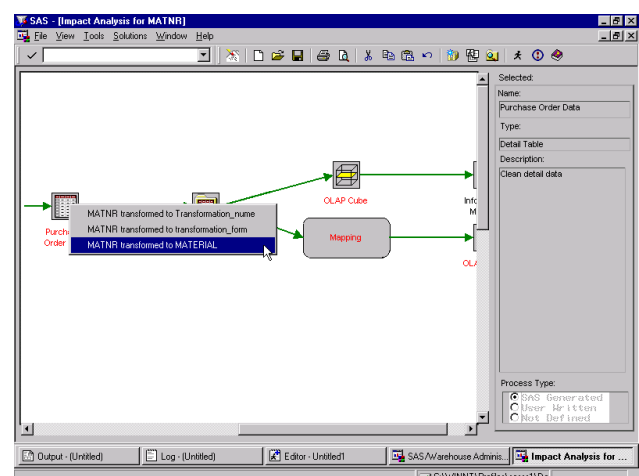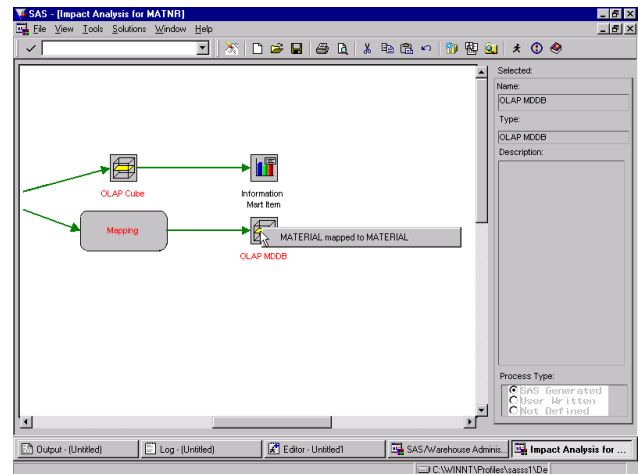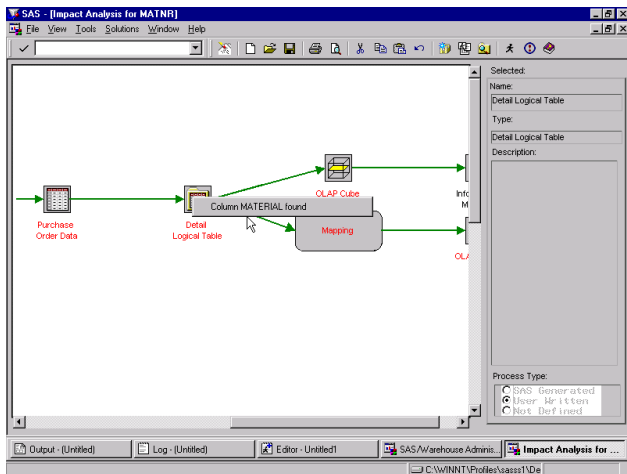
PUBLISH TO HTML

With the "Publish metadata to HTLM page" add-in we can effortlessly create documentation on the process of staging the warehouse.
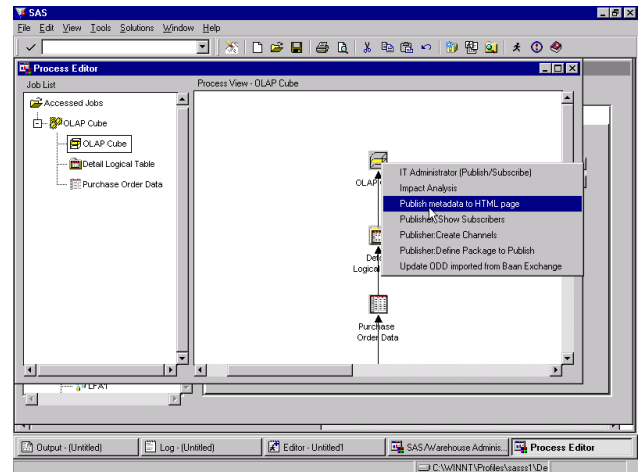
The web pages that are created automatically contain links that allow you to drill into column information, source code, dependencies, notes, contacts and input sources for each structure defined to the process flow.

This feature can save you many man-days of manually documenting the process flow to stage data for your warehouse. Being a data driven application you also reduce the mistakes made in manually documenting the process.

INFORMATION DELIVERY AND EXPLOITATION

Publish and Subscribe add-ins enable SAS/Warehouse Administrator to publish a package of information whenever a Subject or similar group is updated. You can now publish a package of information:

➢ directly to e-mail account(s)
➢ directly to message queue(s)
➢ to subscribers of one or more channels (associated with a warehouse object or explicitly specified with the define package add-in)
➢ to an archive directory (especially good for historical snapshots

SAS/Warehouse Administrator allows for the creation of multi dimension databases. The export facility allows you to share this metadata with /EIS® via the Common Metadata Repository.
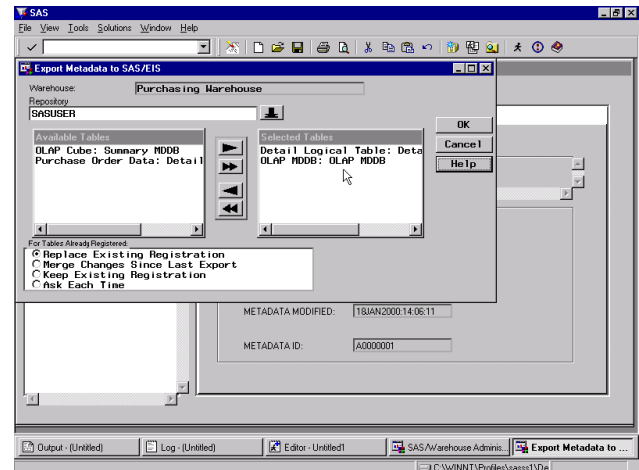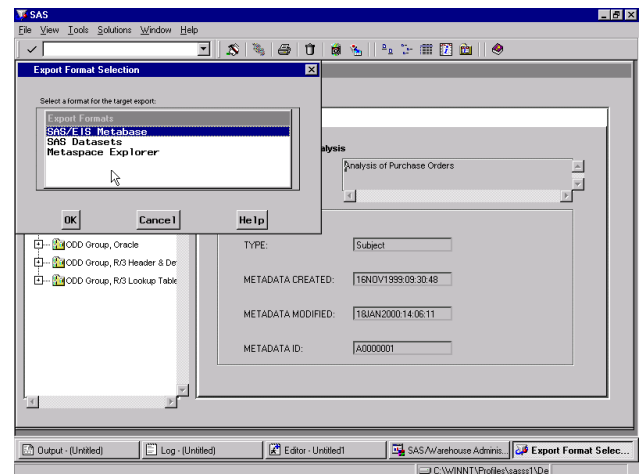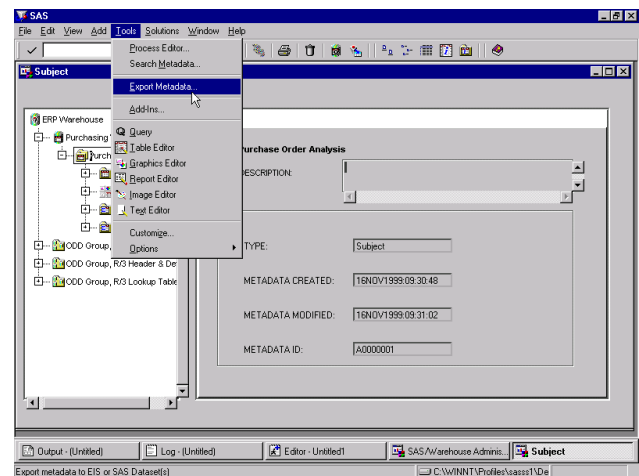
METASPACE EXPLORER®

Metaspace Explorer is a Java applet designed for business users. It is based on metadata that has been exported by SAS/Warehouse Administrator. This out of the box applet allows users to quickly surfaces all of the reports, applications, and data stores defined to the warehouse.
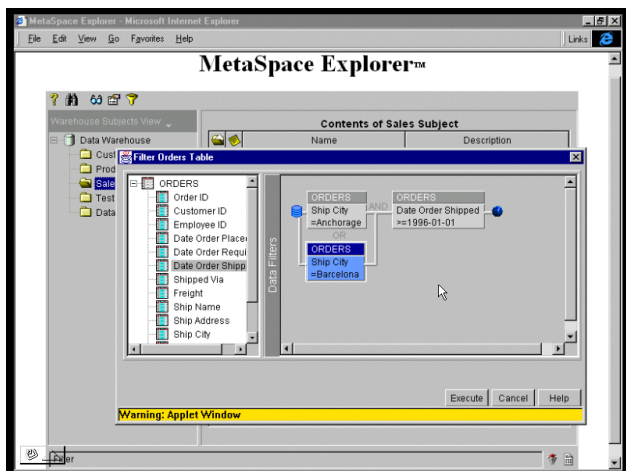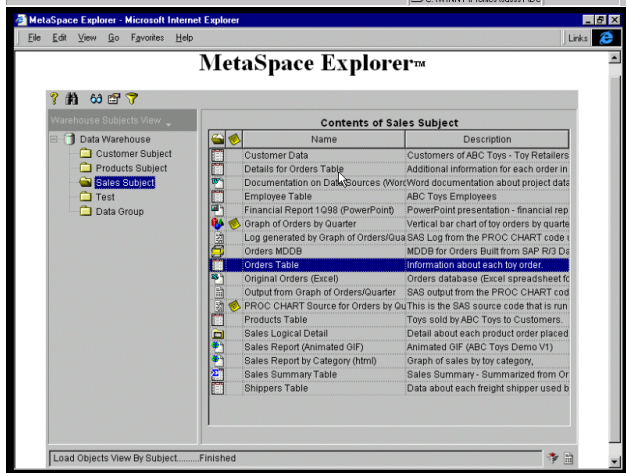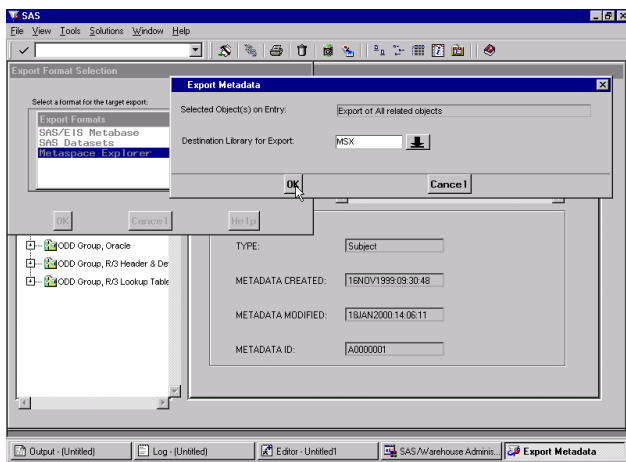
CFO Vision™, Procurement Vision™, HR Vision™) and other solutions and applications (e.g. Quality Center.)
➢ Providing ERP content knowledge to developers of templates, applications and solutions.

SAS business templates provide a warehousing environment that pre defines extractions, transformations and loading requirements of the ERP data necessary to address the defined business problems. This environment is easily extended to meet your specific business requirements with SAS/Warehouse Administrator.

The business templates will help these customers quickly implement and deploy SAS data exploitation tools for analyzing and solving specific business problems. These business templates will focus around some core business activities such as sales, cost, supply chain, financial, quality, and human resources.

Some of the goals of the business template project are to:
➢ Provide a "jump start" for ERP users who want to use SAS software to analyze data collected by an ERP system
➢ Reduce the amount of time required for implementing a back end data warehouse and decision support system with the SAS System
➢ Provide documented best practices for data warehousing and decision support systems applied to OLTP systems
➢ Establish a process for defining and creating prototype solutions for data warehousing and decision support systems with OLTP systems

The pieces of a business template, which are included within a data warehouse definition, include at least the following:
➢ Source definition from OLTP tables
➢ Mapping into an Enterprise Data Model
➢ Accumulation into data element for reporting
➢ Sample interactive reports

Currently EIA is developing a Sales Analysis Business Template based on the SD module of R/3. This will allow you to answer questions about sales, forecasting and marketing analysis.

Sales Reporting: This consists of daily reporting on current sales positions. It generally consists of comparing actual to forecast, closed to in the pipe, and cost. Reports can show actual sales to forecast sales in the process, number of UN-invoiced closed sales. These reports can be broken along the dimensions Time, Geography, Product, Channel, and Scenario. Sales reporting consist of reports that are objective in nature, and can be answered by data in the operational systems.

Market Analyst Reporting: These reports are used by marketing to better understand customer need, and product movement. Product reporting consist of product grouping, and trends. It is based on all orders. The dimensions for these reports are product, location, channel, demographic, time, payment type. Metrics being reported on are number of sales, discounts, net sales, gross sales, cost of sales, and returns.

Financial Analyst Sales Reporting: These reports are used by finance to monitor current income. They are based solely on invoiced sales, and are used to report on the financial health of the Sales division.

CONCLUSION
There are multiple ways to leverage your ERP investment using the SAS® System. From accessing the ERP system via view technology, to reusing and sharing transformations, to documenting, to impact analyses, to a Java based interface designed for the business users, to publish and subscribe

ENTERPRISE INFORMATION ARCHITECTURE®

EIA is an internal R&D group that is responsible for
➢ Coordinating development of current and future business templates.
➢ Establishing architecture, framework and requirements for development of business templates by both internal groups and external groups (e.g. Quality Partners.)
➢ Providing integrated data models to support business templates, Business Solutions Division applications (e.g.

technologies. All can be found within The SAS Intelligent Warehousing Solution for ERP.

REFERENCES

All trademarks above are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brand and product names are trademarks of their respective companies.

The Institute is a private company devoted to the support and further development of its software and related services.

ACKNOWLEDGMENTS

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

> Steven M. Sober
> SAS Institute Inc.
> 6400 South Fiddlers Green Circle
> Suite 1950
> Englewood, Co. 80111
> Work Phone: 303 290 9112 ext. 224
> Fax: 303 290 9195
> Email: Steve.Sober@sas.com
> Web: www.sas.com