Building and Evolving Data Warehousing and Business Intelligence Artifacts: The Case of SYSCO

Daniel E. O’Leary
University of Southern California
oleary@usc.edu

Abstract

This paper investigates the use of data warehouse and business intelligence capabilities to integrate with customers in the supply chain and improve insights into customer sales. By making that same data warehouse sales information available to customers, this paper explores how the data warehouse can provide additional value to those customers, eliminating asymmetries of information in the supply chain. In addition, this paper investigates the evolution of data warehousing into business intelligence, expanding sales information to include marketing associate performance analysis generated for internal use. Further, this paper also examines a methodology that was used for building a business intelligence system. Finally, this paper investigates what appears to be a business intelligence driven focus on enterprise resource planning systems. These issues are illustrated using real world data warehousing and business intelligence artifacts developed at SYSCO.

Key Words: Data Warehouse, Business Intelligence, Artifacts, Artifact Evolution, Business Intelligence Methodology, Implementing Business Intelligence
Building and Evolving Data Warehousing and Business Intelligence Artifacts: The Case of SYSCO

1. Introduction

Researchers (e.g., Watson et al. 2001) have suggested that data warehousing and business intelligence can be used to integrate in the supply chain with customers, by letting customers have access to company information embedded in those systems. However, a review of the literature finds few cases about integration of this type, little information about such systems, and limited analysis about how/what information is made available to customers in such an arrangement.

Further, some researchers, e.g., Golfarelli et al. (2004) and others, suggest data warehouse (DW) systems evolve into a business intelligence (BI) capability, generated on top of the data warehouse to more fully leverage information captured in the data warehouse. Specifically, the reporting and analysis capabilities of business intelligence make the data warehouse more accessible. However, there is limited research and evidence to illustrate the evolution. Further, there is limited discussion about which information firms keep internal, and which information firms share with their supply chain.

There also is limited discussion about how firms actually implement business intelligence systems, e.g., what analytics are used, how those analytics are chosen and what methodologies are used to implement BI systems. Finally, business intelligence appears to be changing firms and the systems that they employ, and possibly the organization design they use to shape the organization (e.g., centralized or decentralized). In particular, it appears that need for business intelligence and the ability to get business intelligence are driving the implementation of single instantiation enterprise resource planning (ERP) systems, which ultimately can facilitate a centralized organization structure.

SYSCO Implementing DW and BI

McAfee and Wagonfeld (2004) generated a case study about SYSCO, investigating the potential adoption by SYSCO of “Business Objects,” business intelligence software and how SYSCO might implement and use business intelligence software. This paper extends that case study to include key components of the underlying technology, including what the data warehouse and the business intelligence systems that were developed by SYSCO effectively “looked like.” In so doing this paper provides a case study of the evolution of data warehousing to business intelligence to business intelligence-based enterprise resource planning systems.

In particular, SYSCO uses a data warehouse to capture transaction sales data from their many decentralized companies, consolidating and standardizing that transaction data so that they have a comprehensive view of all of a particular customer’s purchases, across the independent companies. That data is used not only by SYSCO, but in addition, it is made directly available back to their business partners, effectively providing partners with critical supply chain information and eliminating information asymmetries. SYSCO also uses business intelligence software internally to generate additional insights based on the data warehouse information about company performance and allowing further customer stratification and insights into personnel that interact with customers. In order to facilitate business intelligence, a range of reports have been created for SYSCO users using “Business Objects.” SYSCO also makes “alert analysis”
and “what if” analysis available internally as part of their business intelligence support about the
supply chain.

When Business Objects implemented BI for SYSCO they employed a specific methodology that
was designed to facilitate the design and implementation. The methodology included a specific
approach focused on analyzing key information aspects, for example, who consumes the
information, what is the focus of the information and what are the key metrics. That
methodology is summarized in this paper.

Finally, SYSCO is now going beyond their original data warehouse and business intelligence
design to more broadly leverage business intelligence. In particular, SYSCO is now
implementing a single instantiation ERP system that will allow business intelligence at a level
beyond customer relationships. Further, that business intelligence can allow real time
monitoring that can facilitate a centralized organization structure.

This Paper

This paper proceeds in the following manner. Section 2 briefly reviews the methodology used in
the paper. Section 3 provides a brief background of previous research in data warehousing,
business intelligence and business intelligence implementation methodologies. Section 4
provides background information about SYSCO. Section 5 investigates SYSCO’s OneLink that
allows their customers to access their information in the SYSCO data warehouse. Section 6
analyzes SYSCO’s use of Business Objects’ business intelligence software to facilitate
investigation of performance and customer stratification. Section 7 summarizes the approach
used in Business Objects’ business intelligence implementation at SYSCO. Section 8 briefly
examines SYSCO’s emerging implementation of their enterprise resource planning system.
Section 9 summarizes the paper and its contributions, and discusses some extensions.

2. Methodology

In an intriguing research methodology paper, Orlikowski and Iacono (2001) called for a deeper
more thorough analysis of information technology (IT) artifacts. For example, Orlikowski and
Iacono (2001, p. 121) note, “… we propose that researchers begin to theorize about artifacts.”
Since artifacts are present in both data warehouses and in business intelligence, this suggests that
we analyze those artifacts.

Unfortunately, there is no large database of data warehouse and related business intelligence
artifacts that can be readily investigated. Further, there probably are fewer publically available
joint sets of artifacts and process descriptions of specifications of those business intelligence (BI)
artifacts. As a result, this paper employs case data to begin an examination of these issues,
gathered about a particular company SYSCO. Specifically, this paper uses a case-based
approach, focused on analyzing the underlying artifacts generated as part of SYSCO’s data
warehouse, business intelligence and business intelligence implementation.

3. Background: Data Warehouses and Business Intelligence

This section provides a brief background on data warehouses, business intelligence and
implementation of business intelligence systems.
Data Warehouses

Data warehouses have been used for a range of purposes. In some cases, data warehouses have been used to aggregate information (e.g., accounting) from multiple sources into a single integrated database that allowed comparison and aggregation of different entities/companies. That data could then be examined along multiple dimensions, e.g., time, location or subject, in order to examine trends and other decision issues. Typically, such data warehouses are “read only” and used for decision making, however data warehouses also are used to archive information over time. Immon (1992), Watson et al. (2001) and others discuss these and other characteristics.

Watson et al. (2001) developed a “stages of growth model” for data warehousing. The model has three stages (Initiation Stage, Growth Stage, and Maturity Stage) over a range of variables (data, architecture, users, applications and others). Many data warehouse researchers (Olszak and Ziembba 2006 and others) have noted that data warehouses can be used to support analysis of customer data to improve decision making, but do not examine the impact of having customers have access to data warehouse data. Watson et al. (2001, p. 48) go beyond simply the use of data and suggest that in the third stage “… customers may have access to the warehouse data.” Although this possibility is recognized, there are few, if any real world, fleshed-out examples of making data warehouse data available to customers. Accordingly, this paper provides one such example to mitigate this limitation.

Business Intelligence

The term “business intelligence” (BI) apparently was invented by the Gartner Group in 1989 (e.g., Lawton 2006). Historically, BI was only for the technologically sophisticated, since users would have needed to write their own database queries, or develop their own prediction models, etc. However, increasingly, BI is becoming easier to use, as more capabilities are bundled into the software, and there is a focus on broadly using BI to support organization decision making. Data warehousing and business intelligence ultimately are tightly integrated (e.g., Watson and Wixom 2007). Some argue that even if there was no data warehouse model, in order to use BI, a semantic model like that developed for a data warehouse designed to aggregate or store data would need to be developed. As a result, it probably is not surprising that some researchers (e.g., Eckerson 2007) suggest a BI maturity model that progresses from data warehousing to BI services.

There has been some research in business intelligence, typically in the form of case studies and surveys. For example, Anderson-Lehman et al. (2004) provide a study of Continental’s use of real time business intelligence. Vianen et al. (2009) had an intriguing case analysis of the use of business intelligence in police work. More recently, Isik (2011) did a survey of users’ adoption of business intelligence. However, there are few cases which provide a detailed glimpse of business intelligence artifacts. Accordingly, this paper provides analysis of a set of artifacts to mitigate that limitation.

Building BI Systems

There has been research on building BI systems, both by academics and practitioners. Moss and Atre (2003) and Olszak and Ziembba (2007) provide normative academic models. Ryzebol (2004) discusses an approach used by IBM to facilitate BI system development focused primarily on their DB2 database product. Gangadharan and Swami (2004) provide a BI life
cycle for system development. However, the literature has a limited number of illustrations of methodologies actually used to implement business intelligence systems. Further, there has been little insight into the choice and use of analytics used in the business intelligence systems. Accordingly, this paper provides a summary of the methodology used by Business Objects at SYSCO.

4. SYSCO

SYSCO is a multi-billion dollar food distribution company, based in Houston, Texas. SYSCO procures and distributes food, food products and food services to restaurants in Canada and the United States. SYSCO has over 188 distribution outlets catering to 400,000 different customers, ranging from well-known chains, such as, Chili’s and Wendy’s to individually owned restaurants (http://finance.yahoo.com/q/pr?s=SYY). Restaurants account for over two-thirds of their customers. In 2009 their revenues were $36,853.3 million, placing them number 55 in revenues in the Fortune 500, up from 2006 when they were 65th (http://money.cnn.com/magazines/fortune/fortune500/2010/snapshots/2197.html).

Competition

SYSCO is the largest company in the category “Wholesalers: Food and Grocery.” In addition, SYSCO is one of the more rapidly growing large companies, since in 2002, when their revenues were $23,350.5 million, meaning a growth of almost 60% in the years between 2002 and 2009. In the United States, their top competition includes Meadowbrook Meat Corporation, Performance Food Group and U.S. Food Service (http://www.hoovers.com/company/SYSCO_Corporation/rrctyi-1-1njea3.html). Internationally, SYSCO faces competition from J. Sainsbury, PLC (based in the U.K.), with 2006 sales of $28,545 million, Loblaw Cos. Limited (based in Canada) with sales of $23,701 million and Etablissement Delhaize Freres Cie Le Lion SA with sales of $23,061 million. (Bernard Sands 2006).

Transaction Processing and Data Warehouse Architecture

As noted by McAfee and Wagonfeld (2004), SYSCO is highly decentralized, with almost 200 companies and distribution centers. Consistent with being independent business units, SYSCO does not do all its transaction processing in a central location, nor do all SYSCO companies currently have the same instantiation of the same enterprise resource planning system. Until recently, apparently individual companies could choose their own systems and artifacts to support those systems. As a result, there were no common artifacts, such as vendor lists, customer lists or charts of accounts.

As a result, in order to generate a unified view of their customers, SYSCO uses a data warehouse to pull together the transactions from each of its companies into a single database. Accordingly, that database and architecture allows SYSCO to analyze aggregated information in a manner from which it can begin to generate knowledge from data. Transaction processing data from individual sources in SYSCO are gathered and aligned so that data about customers and other partners is available in a single “enterprise data warehouse.” From that data warehouse, data queries and business intelligence applications can be used to convert the data into knowledge. Analytics and reports are summarized in a data mart where information is made available. The basic architecture is illustrated in figure 1.
5. OneLink – Data Warehouse Access

SYSCO’s OneLink provides user friendly access to data warehouse sales-based information internally and to customers through access to a data warehouse and a query wizard that helps users formulate queries for accessing their data warehouse information. As a result, not only does SYSCO supply specific food products and services, but they also link their customers with information that can help them better understand their business.

As a result, customers can access supply chain information about their SYSCO purchases, accordingly, they are provided with a data warehouse of information that they can use to analyze their own purchases. Further, information can be downloaded to excel worksheets so that customers can better understand and analyze data using tools with which they are comfortable. This approach breaks away from the traditional approaches which only lets the company generating the database access and use the data. Further, it standardizes the information in the supply chain so that both SYSCO and their customers know what goods are being purchased by which customers. With both parties having access to the same information, potential problems of resulting information asymmetry can be mitigated. For example, quantity discounts on purchases can be established, with both parties knowing when those discount amounts are reached. Finally, since SYSCO provides their customers with a data warehouse of information they effectively integrate more closely with their customer beyond providing simply access to products.

Query Wizard’s Approach

SYSCO’s system is set up so that the user, internal or external, can easily choose the information items they are interested in gathering in a three step process. Report items of interest are chosen, as in figure 2. If the user needs help, there is a hyperlink to assist them. After the different items have been chosen, then the query wizard will help the user generate the report they are interested in. In figure 3, some of the drop-down menus for the different items are presented. Users then chose the particular attributes that they are interested in. Finally, in figure 4, the particular sorts and “section breaks” (e.g., by customers or products) are chosen by the user.

In the example in figures 2-4, Wyndham Hotels can generate information about which SYSCO products they buy, from which SYSCO company, and who manufactures the product. In particular, information available from the data warehouse includes a number of dimensions, including “customer” (group name or store name), “time” (e.g., year), “measures” (e.g., price), SYSCO company (by company number), item (e.g., item number) and others. Customers simply choose and compute by dimension. Wyndham Hotels can use this information to better understand their purchases, while SYSCO can generate a customer profile of purchases. Thus, the system provides business insights, not only to SYSCO, but also to their customers.

How Might Information Create Supply Chain Value?

The information architecture of the data warehouse is clearly aimed at an important subset of SYSCO’s information, the customer order information. Further, sharing that information can be important to generating information links with the customer. As seen in the figures 2-4, the data warehouse allows for the customers to obtain information consolidated across their own multiple divisions so that they have a consolidated view of their orders. Thus, ultimately, SYSCO provides a data warehousing capability to their customers.
Unfortunately, generating data to be summarized in a data warehouse from different sources can be very costly and can require substantial maintenance. For example, if one of the companies in SYSCO changes the way that it categorizes information, then that change would need to be accounted for in the way that the data warehouse captures information. As a result, when information is consolidated in a data warehouse, typically only a portion of the transaction information is captured, generally information that is the most valuable, such as customer order information. But even customer order information is dynamic and changing. As new customers are added or deleted, or as products change those changes must be accounted for in a data warehouse consolidation of information. Further, because each company is independent, those changes are driven bottom up by the individual companies or divisions within SYSCO, and not by corporate. As a result, the scope of changes can be very substantial and costly. Accordingly, it might not be considered surprising, as seen below, that SYSCO has moved toward a single instantiation enterprise resource planning system, where information is standardized top down, rather than through the data warehouse.

6. SMART (Sales and Marketing Analysis and Reporting Tool)

After developing their customer data warehouse, SYSCO sought out the ability to generate more information from the available data using business intelligence tools, in particular, “Business Objects.” Ultimately, SYSCO focused on using the business intelligence software to analyze supply chain data, apparently focused on internal use, rather than internal and external use. This section illustrates the software’s implementation, providing information about some of the reports that the software was used to produce.

SMART (Sales and Marketing Analysis and Reporting Tool)

SYSCO called their system SMART (Sales and Marketing Analysis and Reporting Tool). SMART was based on using Business Objects, to generate hyperlinked reports from the data warehouse using different key performance indicators, focusing on performance of marketing associates (MA) and sales to customers by market segment. In particular, in figure 5, there are a number of reports available on the performance of MA that examines a range of issues including performance by brand and category. Further, as seen in figure 6, reports are available for segment sales trends and exceptions and segment churn. Specifically, in figure 6, reports can be generated about Gold Customers, Segment Sales by Category, Segment Revenues and Segment Sales. As a further example, in figure 7, in a dashboard developed for district sales managers, information was broadly broken down into reports developed for accessing information about customer sales, trends and exceptions, and customer churns and movement. In addition to set reports, as seen in two of the tabs in figure 7, the system provides for “what if” analysis and “alert analysis.”

Versions of BI

BI artifacts evolve over time. For example, the change from figures 5 and 6 to figure 7 captures the evolution or change associated with BI at SYSCO. Although figure 7 is a dashboard for the district sales manager (DSM), it does illustrate that “what the BI looks like” is changing over time. Both figures 5 and 7 have information that references marketing associate performance, yet those dashboards provide a user interface look that is a bit different, across a number of dimensions, including information presented, colors, etc. In addition, the apparent relative
information need stability is captured by the similarity of focus of the reports: customers and performance. However, note that the version in figure 7 includes information about “cuisine” and breaks down MA performance into different categories (e.g., wallet, forecast, actual and trend).

**Intra vs. Inter Organization**

The choice of business intelligence analysis of sales personnel inevitably makes the BI “intra” organizational, rather than inter organizational as seen in the data warehouse. However, the choice of analysis of sales and sales/marketing personnel is consistent with a focus on using data to manage, monitor and ideally, increase sales. Thus, the BI reports are more focused on internal, rather than external use. However, given the approach of opening up data warehouse information to customers, if additional information is added to the BI effort, then we might also see the exchange of customer relevant information captured in the BI system.

**7. Business Intelligence Implementation (Taylor 2003)**

Ultimately, SYSCO’s business intelligence implementation loaded two years of data to support 35 different analytic measures, in the form of 1 terabyte of data. Six weeks were taken to choose and define the analytic measures, using 3 joint design sessions. The implementation took roughly seven months to deliver business intelligence in a high availability environment to roughly 2000 users. In a unique document, Taylor (2003) described the SYSCO business intelligence implementation as having three phases: defining and designing the business content, preparing and building analytics and deployment.

**Defining and Designing Business Content**

In order to define and design the business content, Business Objects apparently used a four step approach (figure 8), as part of the implementation.

1. Understand the business “pains”

   In discussing the notion of understanding business pains, Taylor (2003) indicated that the first step was to identify and interview the key stakeholders and find out what drove the project and its benefits, ultimately generating a prioritized list of SSYSCO’s pains and needs. It is at this step that the scope of the subject areas being developed was determined.

   Much of SYSCO’s business pain was driven by the need to first be able to bring together data on almost 200 business entities and then be able to put that data into a format that would allow one standard view of the customer. In so doing managers would be able to compare performance of different MA’s and understand customer purchases, which could facilitate resource allocation.

   Ideally, this assessment of pain would align the implementation with SYSCO’s purpose or focus for the specific BI, which ultimately would tie directly back to SYSCO’s strategy. In particular, the focus on customers’ purchases and marketing associates’ performance suggests that the strategic concern was primarily with sales and sales efforts.

2. Identify candidate analytic measures

   As Taylor (2003) notes, there are many different analytic measures that can be built into the system. As a result, rather than just giving the client a list of measures the analyst needs to
work with management to choose the appropriate measures. Accordingly, in order to facilitate choice of the appropriate analytic measures, a progressive “information model” was developed (figure 9). As part of that model, a number of different questions were used to help guide the choice (figure 9), including, “Why is this information provided?,” “Who consumes the information?,” “What is the primary focus of the analysis performed?” and “How is this information received?”

Analysis of why information is provided suggests a number of purposes of business intelligence are embedded in the system, depending on the hierarchical role: setting direction, monitoring performance, identifying opportunities, improving effectiveness, responding to issues, answering questions, fulfilling requests, analyzing problems and predicting issues. Control information is embedded at each level of management, particularly in the notions of “monitoring performance.”

An analysis of who consumes the information, reveals a BI model based on pushing information out and down to the appropriate information consumers. Further, the project assumes that different hierarchical roles need different information, use information differently, and, as a result, use different types of analysis. Accordingly, the specific analytics need to support those differences. For example, “Vice Presidents” push questions, requests, direction and focus down the hierarchy to business analysts and regional sales managers.

The primary focus of the analysis performed also appears to vary by hierarchical level. “Vice Presidents” appear to be most concerned with seven key sets of analytic measures including, customers, operating company (OPCO) sales and profitability, market penetration, margins and customer retention. Regional Sales Managers are concerned with regional sales, product analysis and customer analysis. District Sales Managers are pushed information that relates directly to district sales and marketing associate performance. While at the lowest level, Marketing Associates are concerned about particular products and customers.

An investigation of how information is received indicates three basic approaches: dashboards, alerts and reports. That mixture is likely to vary by hierarchical role and focus or purpose of the analysis. It appears that in figure 7, that mix has been extended to include other approaches, such as “what if” analysis.

To illustrate the impact of the process, we can compare the report artifact that ultimately was developed for “District Sales Managers” (DSM) illustrated in figure 7 to the requirements illustrated in figure 9. Figure 7 indicates that the two key sets of analytics were “MA Performance” and “District Sales,” consistent with the primary focus of the analysis summarized in figure 9. Similarly, the primary analytics illustrated in figure 9 are the same two factors. In addition to sales information, of the seven measures seen as important to the “Vice Presidents,” market penetration, margins, and profitability are represented by tabs on the DSM’s dashboard. Further, the DSM’s dashboard also adds information about productivity, “What if” analysis and “Alert analysis.” Accordingly, we can trace the evolution of the artifact used in the process to the final output artifact.

Additional detail about metrics and the tie to particular “purpose” or “focus” is provided in figure 10. For each of the different hierarchical groups of roles (e.g., “Vice President”), a matrix was produced to guide the design and implementation of the analytic measures, ultimately relating specific “focus/purpose” (operating company sales trends, based on
strategy), to “analytics,” (e.g., sales by geography), “KPI/measure” (e.g., sales, both sum and average) and the “dimension/grain” (e.g., for each customer segment, roll-up from district to region to operating company).

3. Assess the capabilities gap

The candidate analytic measures drove the need for particular information or data. As a result, the next step was to determine the extent those analytic measures would be supported by existing data. Since SYSCO had already generated the data warehouse, much of the data necessary for the analytic measures was already available. Thus, assessing the capabilities gap meant determining if the data warehouse information would support the desired capabilities.

Accordingly, Taylor (2003) specified a number of basic steps as part of the process of determining the capabilities gap: assess potential data sources (if data beyond the data warehouse was needed), map data sources back to the analytics measures to make sure that the data to support the measures exists, confirm frequency of data availability from the source systems (to ensure that the expected time frames are covered) and identify any business rules that may affect the data over time.

Ultimately, Taylor (2003) suggested that a key determinant in the amount of effort required in the implementation of the analytic measures, was whether or not the data required for the specific analytic measures was readily available in the data warehouse or other source. If the data is available as part of the current system, then the amount of effort is less than otherwise would be the situation. However, in any case, the specific content and the ability to apply the information in that content is a critical factor in the capabilities gap.

4. Agree on the content

A number of vehicles were put in place to facilitate agreement on the content. After assessing the available information and the corresponding capabilities gap, based on data availability, analytic measures were agreed on. In order to facilitate agreement on the content, prototype mock-ups were built, and the report layouts and final dimensions were generated. Three joint design sessions were used to capture critical input about analytic measures.

Preparing and Building Analytics

After choosing the analytics, Business Objects used multiple steps to prepare and build the analytics for SYSCO, including data sourcing and loading, data validation and performance tuning.

Since data sourcing and loading took the most time, Taylor (2003) argued that this step needed to begin as soon as possible. Further, since the reports have a tendency to evolve over time, it is important to consider data in the subject area, not just the specific analytic measures. Throughout, interaction between the business intelligence analysts and the data base administrator is important to ensure the data gets mapped appropriately into the measures.

Of course data validation, tracing report data to the specific relational database is required. Data roll-ups need to be validated and tested for their generality and stability. For example, if SYSCO employs new sales person and they are given customers from other existing sales territories, the nature of the sales territory “roll up” could change, and this could affect sales history data.
Performance tuning requires analyzing a number of concerns generally associated with data warehouses and databases. For example, queries can be optimized and rather than doing a lookup, materialized views could be used. As another example, optimizing a relational database server for one environment could have a negative impact on other environments. Finally, hardware concerns, such as ensuring that there is sufficient direct access storage available can be critical to performance.

**Deployment**

As seen in *figure 11*, the project had a classic project design, with communication with top management, and active participation by top management at corporate and in the operating companies. At the top of the project was the “Business Steering Committee,” to whom the “Project Management” reported. Although management met informally on a weekly basis, the steering committee met formally every three weeks.

The overall project team included three full-time resources in the area of analytic measures and five in the area of data (*figure 11*). The data team and the analytic measures teams worked very closely across the entire implementation.

The implementation was done in waves of roll-outs to different SYSCO companies (*figure 12*). Within each of the roll-outs they used a sequence of “plan-evolve-commit-train” activities. Using this approach, the first 13 companies went live in 3 weeks. In the plan phase, the project team approached the target operating company’s senior management, vice presidents and senior business analysts and jointly planned and prepared for the deployment of analytic measures within that specific company. After planning, the “evolve” portion of the project would ensure that the particular SYSCO Company’s data was prepared and entered into the data mart used for the analytic measures, and then key operating personnel needed to analyze and verify that the data was correctly entered. Finally, in the commit phase, the appropriate processes and roles were established and personnel were assigned to those roles. In the training phase, personnel from the SYSCO company received the appropriate training so that they were familiar with the analytical measures and the information format, whether it was dashboards, alerts or reports.

**8. Emerging ERP Implementation**

In December 2008, SYSCO began implementing an enterprise wide enterprise resource planning system using SAP, the company that acquired Business Objects. That implementation was more than just a technology implementation, but was one that was expected to change the way that SYSCO did business. In particular, as noted in SYSCO (2009a),

> “With the ERP project, we are taking the opportunity to review many of our processes and finding ways to further streamline our operation. It’s important to note that this project is about a lot more than technology. In the end, the technology is an enabler for what we are designing, which is a business transformation.”

More recently Schneider (2010) quoted a SYSCO executive vice president, who noted

> “Sysco intends to improve productivity, retain and expand business with existing customers, and understand where market opportunities lie so we can do a better job attracting and pursuing new business.”
Interestingly, although much of that statement is consistent with previous data warehousing and business intelligence activity discussed up to this point, the notion of “productivity” is only partially a capability of the systems developed prior to the ERP implementation. Accordingly, it is likely that the SAP implementation also will facilitate BI of the cost portion of SYSCO’s business, not just the revenue side.

Principles and Relationship of ERP, DW and BI at SYSCO

Reportedly, SYSCO’s SAP implementation has five “Guiding Principles” (SYSCO 2009b)

1. Create strategic competitive advantage
2. Optimize the core business by reducing complexity, redundancy and inefficiency of business processes and supporting technologies
3. Operate as a seamless single collaborative entity
4. Redefine the customer experience to further differentiate our products and services
5. Implement processes and technology to enable future business growth

Principles 2, 3 and 4 are particularly important to the data warehouse and business intelligence aspects of SYSCO. Principle 2 will move toward standardizing processes and information gathered by the many different SYSCO companies. Process standardization necessarily will include both the cost and revenue sides, in contrast to the existing data warehouse approach, resulting in both cost and revenue business intelligence opportunities. Principle 3 effectively calls for implementation of a single instantiation of SAP across the many diversified operating units of SYSCO. With a single instantiation there will be greater similarity between the capturing of information across the different operating units. SYSCO will be able to track their own purchases and gain greater economies of scale as visibility into their own company inventory is facilitated. In addition, visibility into different customer purchases also will increase. This will effectively eliminate much of the need for the current data warehouse structure, since currently the data warehouse serves as a gathering and aggregation point for disparate data in order to create a common view of the customer. Principle 4 suggests that they are planning on expanding the standardized information set beyond the current view of customer orders so that SYSCO can provide additional value and linkages in information.

A tentative timetable for the SAP implementation is given in figure 13. As noted by Duvall (2010) SYSCO will rollout SAP’s Business Suite in 2011, including SAP’s Business Objects’ business intelligence. SYSCO will first deploy a large operating company in 2011, and then deploy waves of other SYSCO companies through 2013. The wave approach will allow them to take key “best practices” generated in one implementation and use those in subsequent implementations.

Business Intelligence Driven ERP

The implementation of the ERP system will allow SYSCO the ability to use business intelligence on more than sales side data. In particular, the implementation of a single instantiation ERP will replace the need for the data warehouse gathering of sales data, and it will make cost side data available for business intelligence broadening the basis of analysis that can be done using BI. This exemplifies the extent to which the need for business intelligence is likely to drive firms towards implementation of a single instantiation of an ERP system.
9. Summary, Contributions and Extensions

SYSCO has been a remarkably successful company, increasing their sales by over 40% in the last few years, while becoming the dominant company in their industry and the leading company in its business niche in the world. In support of that growth they have used technology to generate important decision making information. However, they have not kept that knowledge internal; instead they have allowed supply chain partners to access much of that knowledge, ultimately, providing partners with insights into their own purchases. SYSCO’s opening up those knowledge resources to their customers, establishes a stronger link with their customers. Not only are they providing product, but they are providing information that allows them and their customers to better manage their business processes. This strong incremental benefit only requires an incremental investment by SYSCO since the same information is used by both SYSCO and their customers.

However, SYSCO did not stop with a data warehouse. In addition, business intelligence software from Business Objects is used to provide SYSCO with greater insight into their customers and the ongoing supply chain performance of products and associates.

Contributions

This paper provides an analysis of data warehouse and business intelligence artifacts and the process used to generate the business intelligence artifacts, including some of the artifacts actually used in the process. We investigated some of the characteristics of those artifacts.

The paper also extends the McAfee and Wagonfeld (2006) study to include information about how SYSCO links with their customers and how SYSCO actually uses business intelligence and data warehousing in their business. In addition, this paper provided insight into key issues associated with the implementation of business intelligence in large decentralized companies and how the need for business intelligence information in at least one company appears to be driving implementation of a common instantiation of an enterprise resource planning system that could facilitate a centralized organization structure, accommodated by the real time business intelligence.

Extensions

This paper could be extended in a number of different ways. First, in the future, additional detail on how each of the approaches used here have evolved could be generated and discussed. For example, as business intelligence evolves over time, we could re-examine if for changes in the way it is offered and used. Second, this paper has offered case-based evidence for how companies can link with customers by allowing them to view some of the data that they have in common. Further research is needed to better understand how well this mechanism works in other settings. Third, apparently SYSCO is moving to implement an enterprise resource planning system that presumably would have many standard characteristics of each instantiation. As that system and new architecture is implemented, the evolution across technologies and the impact on the data warehouse and business intelligence could be studied. Alternatively, the impact of SYSCO’s use of data warehousing and business intelligence on the enterprise resource planning system implementation also could be studied. Fourth, research could be initiated into the extent to which customer companies use information available to them from such data
warehouse and business intelligence applications, and how companies actually use that information that they are provided. Fifth, SYSCO has a chance to extend the data that they make available to their customer to include some of their business intelligence. Such disclosure could be tracked and investigated to determine the impact. Sixth, a “stages of growth model” could be developed for business intelligence, analogous to Watson et al. (2001). Seventh, the implementation methodology used by Business Objects could be compared to other methodologies through the use of artifacts and artifact content. Eighth, as noted above, SYSCO is heavily decentralized. However, the movement toward a single common instantiation of SAP will facilitate more of a centralized focus, particularly when the resulting BI capabilities are considered. Now information will be broadly available, and many intra company asymmetries of information will be reduced. As a result, the impact of these systems on SYSCO organization structure could be studied to determine if there is a shift from decentralized to centralized management.
Acknowledgement

Acknowledgements: An earlier version of this paper was presented at DSS 2010 in Portugal. The author would like to acknowledge the anonymous referees’ comments and suggestions.

References


SYSCO Data Warehouse Architecture

Figure 1

<table>
<thead>
<tr>
<th>Customer</th>
<th>Time</th>
<th>Invoice</th>
<th>Item</th>
<th>Measures</th>
<th>Sysco Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Group Name</td>
<td>Year</td>
<td>Invoice Number</td>
<td>Product Category Name</td>
<td>Qty Purchased</td>
<td>Sysco Company Number</td>
</tr>
<tr>
<td>Customer Store No</td>
<td>Month</td>
<td>Invoice Date</td>
<td>Item Number</td>
<td>Sales Price</td>
<td>Sysco Company Name</td>
</tr>
<tr>
<td>Customer Store Name</td>
<td>Day</td>
<td></td>
<td>Item Description</td>
<td>Unit Price</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
<td></td>
<td>Item Brand</td>
<td>Avg Unit Price</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td></td>
<td></td>
<td>Pack/Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td></td>
<td></td>
<td>Manufacturer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postal Code</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data Warehouse Report Generation
Figure 2
Source: Stubblefield (2004)
Specify how to limit the data returned:
Need help?

Select Date:
Begin Date: ___________________________ End Date: ___________________________

Sysco Company:
Select All
Albany
Arizona
Arkansas

Product Category:
Select All
CANNED AND DRY
CHEMICAL/JANTRL
DAIRY PRODUCTS

Customer Group Name:
Select All
PERFORMANCE HOSPITALITY MANAGEMENT DIVISION
SUMMERFIELD SUITES MANAGEMENT DIVISION
WYNDHAM GARDEN HOTELS
WYNDHAM HOTELS
WYNDHAM HOTELS EXPORT

Manufacturer Name:
Select All
20/20 PRODUCE
3M VZR03037 (DC)
A & L SYSTEMS
A BOHRER & CO LTD
A CAMOCHO

Query Wizard Drop Down Menus
Figure 3
Source: Stubblefield (2004)
Data Attribute Choice from Report Generator

Figure 4

Source: Stubblefield (2004)
**SMART-Business Objects – Performance Reporting (MA=Marketing Associate)**

**Figure 5**

Source: Stubblefield (2004)
SMART-Business Objects – Customer Stratification

Figure 6

Source: Stubblefield (2004)
Figure 7 (DSM – District Sales Manager)

Source: SYSCO (2009)
Figure 8 - Approach Used by Business Objects to Choose Business Content

Business Objects Analysis of Information Provided/Received/Consumed
Figure 9
### Sample Information Detail

**Figure 10**


![Diagram](image)

---

**Project Team**

**Figure 11**

Project Rollout Approach

Figure 12


SAP ERP Project Time Table

Figure 13

Source: SYSCO (2009b)