



# Standards Drives Value, Reduce Risk and Deployment Time in DW/BI Projects

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## **Abstract**

The Association for Retail Technology Standards (ARTS), a division of the National Retail Federation (NRF), is an international membership organization dedicated to reducing the costs of retail technology through standards. The retailer-driven membership organization works with technology vendors to create international retail technology standards. This article discusses the information challenges that retailers face, the ARTS data model and data warehouse standards initiatives, and how the vendor-supported standards drive value in their business intelligence (BI) deployments.

## **Keywords**

ARTS, NRF, Retail BI, Retail Data Warehouse, Data Warehouse, Data Warehousing, Business Intelligence

## Trying Times – How Connected Are You?

In the current economic climate of tight credit, high unemployment and low consumer confidence, spending is down and retailers are feeling the pinch. The slowdown in spending started in late 2007, accelerated in early 2008 with the peak in gas prices and seemed to reach a crescendo in late 2008 with the financial crisis. Many retailers have scaled back inventories, remodeling projects, and new store openings, conserving cash as best they can. Credit lines and loans to cover holiday inventories and expansions are extremely difficult to obtain, so retailers are looking to optimize operations and inventories, scaling back expenses wherever they can. In tough times the leaders in any industry are tested and the ones who have put themselves in a strong competitive position are better able ride out the storm. In a down cycle there are opportunities and trusting in your core competencies and investing wisely will make your business stronger when the market rebounds -- and history assures us the upswing will happen!

Retail is one of the largest industries in the world. In the US alone consumers purchased over \$4.5 trillion (2007 -National Retail Federation) and was second in the number of businesses and employees. These figures translate into millions of products and trillions of transactions. Competition is brutal and understanding customer buying habits, preferences and tendencies are critical, as is having the right mix of merchandise to optimize floor space, minimizing out of stock situations, improving promotions and loss prevention are all critical to profitability.

There is a transformation of sorts taking place in the retail industry brought on by the Internet and Web 2.0 technology. More and more consumers are becoming connected through their computers at home, at the office and most recently through the computer in their pocket...their cell phone, which today is much, much more than just a cell phone. Retailers can now market directly to consumers and consumers can respond immediately. In some cases, the consumer can even be involved in the design of the products they purchase.

So how well connected a retailer's management team is to their stores, their supply chain, inventory levels, and to the point-of-sale is critical to retail competitiveness. More and more retailers are following the lead of Wal-Mart and providing inventory visibility to suppliers, who are then responsible for maintaining inventory levels.

Once connected, making sense of, optimizing and predicting performance is where Business Intelligence (BI) plays an important role. Business Intelligence is helping the entire retail management team from the board of directors to store and category managers, giving them insight into the details at near real-time speed, allowing them to be truly connected to consumer activity. The result is faster, smarter decisions and a more competitive organization.

## BI is Top Technical Priority

According to Gartner, Business Intelligence Applications have been and continues to be the top technology priority for Retailers. Business Intelligence has in recent years played a vital role in elevating competitiveness for retailers. Better information about what is happening at the point of sale is critical. Category managers can watch the movement of each article category and make changes in product mix every day if necessary. Sales management can know what products pull customers into stores and optimize their promotions accordingly. Store Managers can understand customer traffic patterns and optimize staffing levels to better serve the customer and reduce staffing cost at the same time. Retail Business Intelligence elevates awareness of how each store, product, and promotion is performing, enabling each member of the retail team to have the information they need to make better and quicker decisions to improve turnover and profitability.

### RETAIL TECHNICAL PRIORITIES

1. Business Intelligence Applications
2. Security Technologies
3. Mobile Workforce Enablement
4. Collaboration Technologies
5. Customer Sales and Service
6. Service Oriented Architectures
7. Workflow Management
8. Networking, Voice and Data Communications
9. Virtualization
10. Legacy Application Modernization

Source: Gartner EXP (2006)

## Information Challenges

The number of transactions occurring daily in retail is mind boggling. Terabyte databases are common and recently petabyte data warehouse environments are being deployed. It is not uncommon for large retailers to have tens of millions of customer transactions daily. Extracting meaningful information from millions of transactions that can be acted upon in near real-time is a huge challenge. And understanding each stakeholder's information needs is vital. The type of information and the granularity at which they need it varies greatly depending on the individual's responsibilities in the organization.

For instance, **Store Managers** are interested in meeting store sales and customer satisfaction objectives by having the right products on their shelves, minimizing out of stock situations and maximizing the customer's shopping experience. They focus on key business initiatives, store presentation, marketing execution, inventory management, loss prevention, payroll management, risk management, and daily operational cost control. **Category Managers** are responsible for developing product assortments using market trend analysis, as well as managing sales and margins. Category Management is a multi-faceted position that includes contract negotiations, inventory management, sales planning, and forecasting. **Chain or Region Managers** are responsible for the overall performance of retail stores within an assigned territory or district. They are also responsible for ensuring district-wide customer satisfaction, product quality, and financial performance. These are just a few of the stakeholders in the retail organization that need the right information in near real-time.

## IT Challenges

Retailers spend less on IT than most other industries and generally have small staffs. As a result they are always looking for more cost effective ways to address their information technology challenges.

Millions of transactions and terabyte databases sound ominous enough, but mix in the fact that many retailers have multiple point-of-sale (POS) systems, loyalty systems, web store and ERP systems. So, IT must not only maintain and upgrade the existing infrastructure, they must also find ways to launch and manage new initiatives, like data warehousing / business intelligence projects. That's where the Association for Retail Technology Standards (ARTS) can help.

### Investments in IT (% of Revenue)

- Banking - 6.0%
- Health Care - 3.5%
- Manufacturing - 2.0%
- Retail - 1.6%

Source: InformationWeek

## ARTS Data Management Standards



ARTS is an international membership organization whose mission is to enable the low cost, rapid deployment of technology in retail by reducing integration efforts through platform independent and vendor neutral standards. Founded in 1993, the organization is composed of 208 retailers and vendors of which 52% are US based and 48% are international. Since inception ARTS has been developing and delivering standards exclusively to the retail industry. The standards are a result of thousands of hours of experts applying their knowledge of the industry, its information requirements, and understanding trends in retailing and technology.

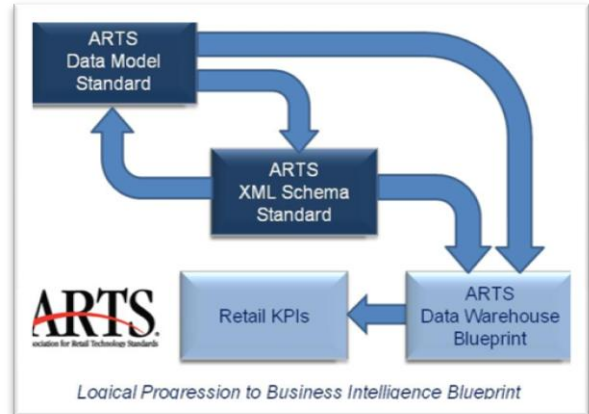
ARTS has standards initiatives focused around four major areas: Data Management, XML schemas, Unified POS and Requests for Proposals. The focus of our discussion is around the Data Management standards which first took the form of an Operational Data Model. First released in 1996, the Data Model standard is expressed as a database design (a definition of 602 tables and 4500 data elements) that has evolved to address all major retail areas and provides a blueprint for gathering and integrating data.

The Data Model standard is a conforming standard. Vendors can design their operational systems according to the standard and ARTS will verify the level of conformance. To be judged Data Model Conformant, physical or logical databases must match 60% of the ARTS Data Model relationships and elements. Retailers who purchase ARTS Data Model conformant operational systems know they are getting retail best practices that will easily integrate with other conformant systems through use of the standard XML schemas ARTS developed from the Model.

## Data Warehouse Model

On April 17, 2008 ARTS announced the availability of a Data Warehouse Model Blueprint designed exclusively for Business Intelligence (BI). Note that the model is called a Blueprint and not a Standard. This is because to be useful to a specific retailer, each Data Warehouse has to incorporate the language and semantics of the business that will use its information. So it is unrealistic to create a single standard. Instead the model is intended to be a sample template that retailers and software vendors may use as a basis for building their own distinct Data Warehouse.

The Data Warehouse Blueprint leverages 15 years of work on the Data Model standard and defines a Data Warehouse Dimensional Model, Data Definitions, mapping from the Operational Data Model to a Data Warehouse Model, and standard Key Performance Indicators (KPI) that retailers would want or expect to have if they implemented a BI solution. There is a natural progression from Data Model, to XML Schema to the Data Warehouse Model that expands the Data Management models into the functional and technical areas common in BI solutions. The result is the standard continues to grow in value and applicability for retailers.



## Relating the ARTS Data Management Standards to BI Solutions

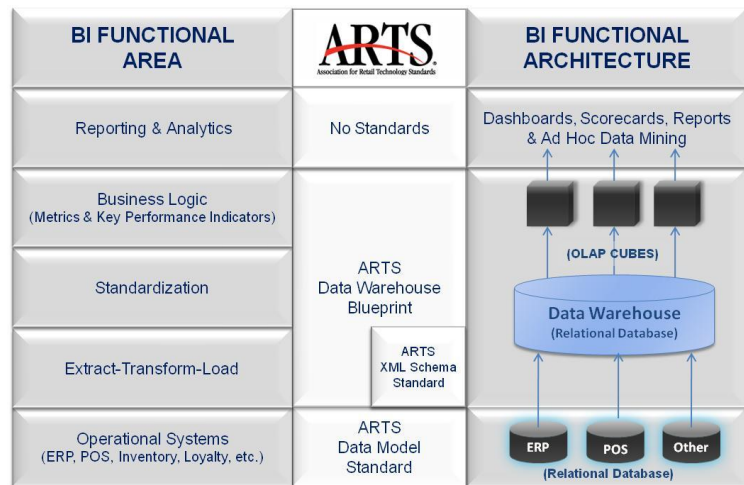
In dissecting any Data Warehouse based BI solution, there are five main Functional Areas.

*Operational Systems* are the transactional systems that capture and record day to day activity and can consists of ERP, Point-of-Sale (POS), Inventory, Webstore website, Loyalty, Catalog and Human Resource systems.

ERP systems typically address General Ledger, Purchasing, Accounts Payable, Accounts Receivable and Inventory. At the very least financial data is obtained from the ERP system. POS systems capture each cash register transaction and stores transaction details such as: Item ID, Discount, Promotional Code, Location, Department, Register ID, Time-Date, Payment Type and Customer Information.

The ARTS Data Model standard was established for retailers and their operational application vendors. Operational application systems collect detailed transactional data and organize it to optimize high-volume, high-speed processing of sales, tender, purchasing, inventory control and other interactions between the retailer and their customers and suppliers. This detailed transactional collection of data is the raw material used by BI to extract, transform, load and derive useful information that managers can use to monitor the execution of their business strategy and forecast future trends to help steer that strategy.

Respective to the BI Functional Architecture, Operational Systems are essentially data repositories normally implemented using relational database technology. Most retailers have multiple non-ARTS compliant Operational Systems and also have duplicate, but not necessarily identical, information stored in these databases. For example customer account information is many times duplicated in the POS, loyalty and web store databases. As a result the duplication and inconsistencies must be addressed by the Data Warehouse to obtain one version of the truth.



*Retail Business Intelligence Solution Stack*

*Extract-Transform-Load (ETL)* is the process for retrieving data (measures and dimensions) from Operational System databases and populating the data warehouse. Development of ETL code can be a very time intensive and expensive process using traditional ETL tools. The ARTS Data Warehouse model provides the mapping between Operational data that support the ARTS Data Model and the ARTS Data Warehouse Model. The ARTS XML Schema standard also provides an alternative method for moving Operational data into the Data Warehouse. The most common data warehouse technology is the relational database.

*Standardization* is the process establishing standard naming conventions for Operational data that may be duplicated and inconsistently named, e.g. customer account information. The objective is to have one name for any given measure or dimension and to consolidate Operational data to that name. The process of Standardization improves the usability and performance of the data warehouse and eliminates duplicate data. The ARTS Data Warehouse model includes a standard dictionary of names that is used to consistently name measures and dimensions in the Data Warehouse.

*Business Logic* is comprised of the calculations used to derive calculated measures and KPIs. For instance, a common calculated measure is Percent Gross Profit. Exactly how Percent Gross Profit is calculated by any given retailer could be slightly different. What is important in a BI solution is that the Business Logic for calculating Percent Gross Profit is centrally administered, so that everyone sees the same calculation result or what is commonly called *one version of the truth*. KPIs provide more information for the user than a calculated measure. For instance the KPI, Sales per Unit Area, includes a *Value*, and information regarding whether or not the KPI is meeting the desired *Goal*, depicted via a graphic and or a color code, and what the *Trend* of the KPI is: Steady, Up or Down, typically depicted with a arrow indicating the trend. Understanding the KPIs for any business, beyond the pure financial KPIs, can sometimes be a difficult and sometimes requires the help of external consultants. Retailers adopting the ARTS Data Warehouse Model will have retail KPIs already defined for them. Typical retail KPIs are:

- Prior Period over Current Period Sales
- Sales per Unit Area
- Top Selling Items
- Bottom Selling Items

From a BI solution implementation perspective, Business Logic is commonly deployed in On-Line-Analytical-Processing (OLAP) Cubes. OLAP technology has been around for a long time and in essence is database technology that allows for the extremely efficient storage of data so that it can be retrieved very quickly and with the added ability to slice and dice the data using dimensional data. The OLAP capability enables easy navigation in a hierarchal structure familiar to business users, like their corporate structure, product lines and sales regions, for example, allowing users to play what-if with their data and do it very quickly as compared to querying a relational database which can be very slow and cumbersome.

*Reporting and Analytics* addresses the delivery of information to the users in the retail organization. The most popular and preferred solutions are dashboards and scorecards which if designed properly provides each user in the organization with the metrics and KPIs relevant to their job responsibility. Another facet is the ability to perform ad hoc analysis / data mining. This is typically the job of the data analyst who is tasked to investigate and extract specific performance information for management.

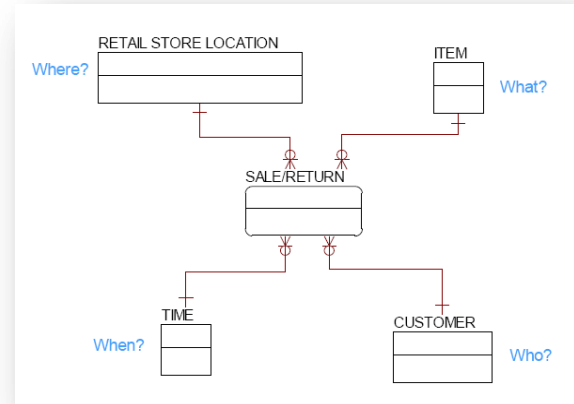
The ARTS Data Management standards and especially the recently release Data Warehouse Blueprint enables vendors and retails to reduce risk and speed deployments. The standards and well as the ARTS standard Request for Proposal standards drastically reduces the time and investment for retailers deploying BI solutions.

## The Retail Dimensional Model

The fundamental Data Warehouse Dimensional Model, as it is known, is very straight forward. In general, Dimensional Models follow a fairly standard pattern. In Figure X, the center rounded rectangle is the Fact entity. A Fact entity is a quantitative description of business activity and includes the numeric measures that may be aggregated in different ways to gain insight into business activity.

For example, the Measures in the Sales/Return Fact table include, at a minimum, the following, which can be and normally is augmented by each retailer in their Data Warehouse solution implementation:

- Sales Quantity
- Gross Sales Amount
- Transaction Price Modification Amount
- Item Price Modification Amount
- Net Sales Amount
- Retail Store Currency
- Net Sales Amount
- Tax Amount
- Cost of Goods Sold



ARTS Data Warehouse Dimensional Model

Facts by themselves may tell you how many items are sold or how much revenue was earned, but the information is irrelevant without context. Context is information about What was sold, When it was sold, Where it was sold, Who bought it, etc. In Figure X, Context is supplied by the outer square cornered rectangles which are called Dimensions. A Dimension entity is an independent entity that defines the context for a fact entity type. The dimensions defined in the ARTS Data Warehouse Model are conformed dimensions. A Conformed Dimension is a dimension that is shared across Fact tables. This guarantees that the same terminology and values will be used for all reporting in the organization, which eliminates departmental conflicts over terminology definitions. Conformed dimensions ensure enterprise reporting and analysis consistency.

One way that the ARTS Data Warehouse Model will differ from the ARTS Data Model is that the dimensions will become concrete. Dimensions, which define the business context around facts, are unique to each retail business. For example, the ART Data Warehouse Model Location dimension reflects the way a retailer chooses to divide their world into market areas and stores. A small regional retailer will have fewer levels for subdividing their market than a world-wide retailer. A retailer specializing in buyouts and distressed merchandise will typically track merchandise down to a class level while a high-end jewelry store will track merchandise down to each piece of jewelry in stock. The point is that every retailer will personalize dimensions to fit their business model. The ARTS Data Model anticipated this requirement and provides a very flexible set of data structures to support a variety of retailer models. For operational data models this flexibility is provided through a high-level of abstraction. Business people never deal with that abstraction directly. They always see it through applications which hide the complexity of the operational data model. This allows for application configuration flexibility without detracting from performance.

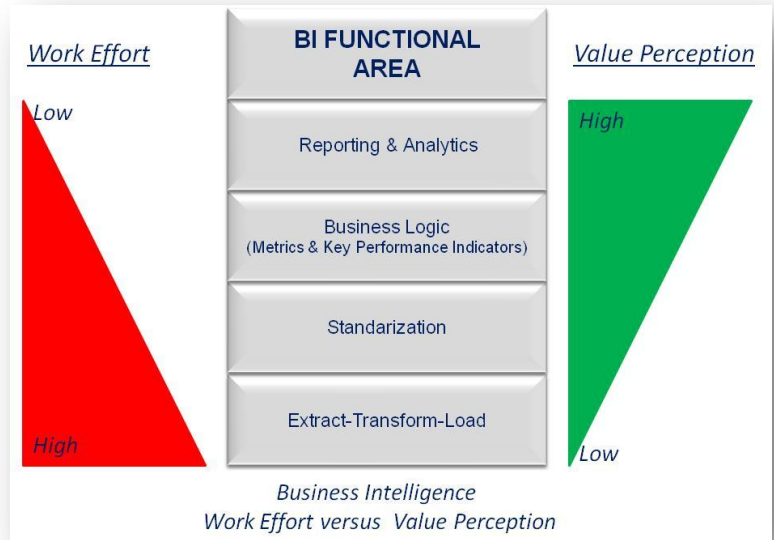
Data warehouses are intended to be used directly by merchandisers, buyers, store operations, financial executives and other retail decision makers and have to be designed with query performance in mind. The semantics, structure and syntax used to define the objects of a data warehouse have to be understandable to these business users.

## ARTS Standard Reduces Risks, Cost and Deployment Time for BI Solution

Ask any business executive where their BI solution delivers value and without exception they will say in the reports, dashboards and scorecards that deliver the KPIs, trends, and metrics they and their management teams use to track performance.

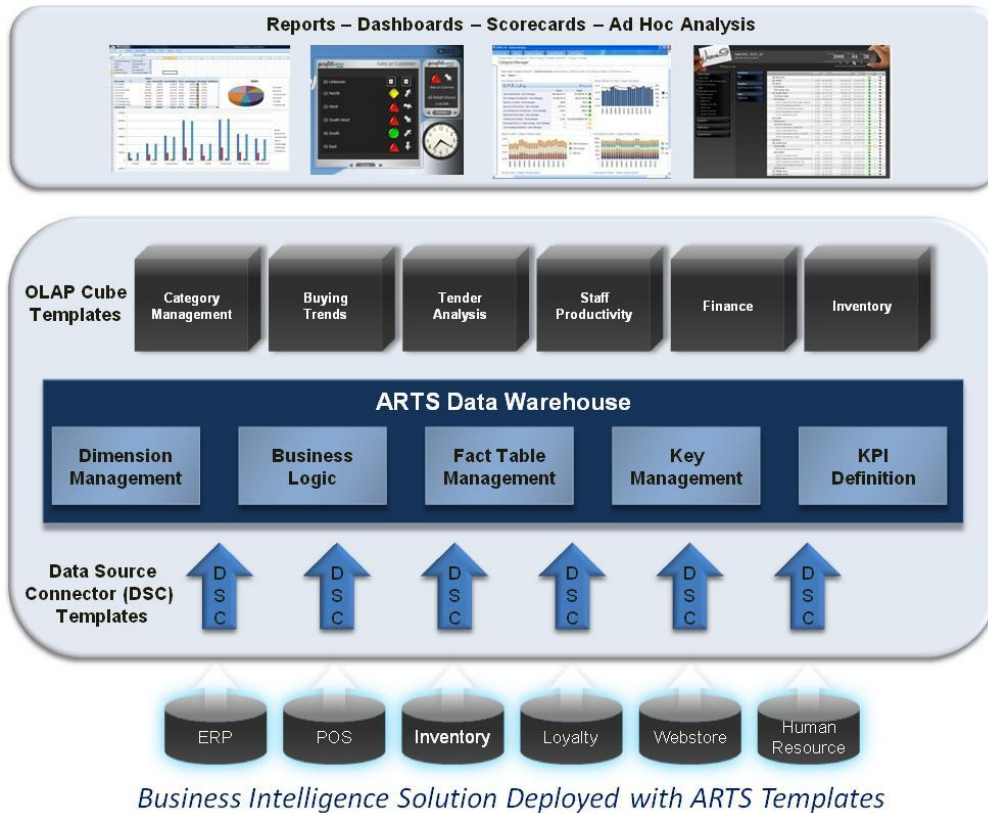
Ask any IT executive where the work effort and highest risks is in implementing a BI solution and without exception they will say in the extraction, normalization and business logic programming needed to deliver accurate information to the reports, dashboards and scorecards that decision makers use. Development of the reports, dashboard and or scorecards, while not trivial by any means, is relatively straight forward using today software tools which includes all types of graphical objects and drag and drop configuration and therefore requires the lowest work effort of any of the BI functional areas.

So even with the ARTS Operational Data Model, Warehouse Model, XML schemas and the Master Data Management guidelines, which can certainly save a retailer time in discovery and requirements definitions, the fact of the matter is that there is still a great deal of work to develop and deploy a data warehouse / BI solution. That is unless your BI solution supplier has captured the standard in some way to enable quick deployments reducing the total work effort dramatically.



## Profitbase Templates – Out-of-the-Box Value

The ARTS Data Warehouse Model is a very thoroughly researched and documented set of requirements that are the starting point for the data warehouse / BI solution provider. The challenge is how to capture the standard so it can be easily and quickly deployed over and over. Additionally, it must also be possible to easily modify and adapt the standard to each retailer's unique information requirements and Operational Systems.



The approach that Profitbase has adopted is to capture the Data Warehouse Model in templates, specifically Data Source Connector and OLAP Cube Measure Group Templates. Data Source Connector Templates are built using standard Fact and Dimension names (Standard Names) as defined in the ARTS Data Warehouse Dictionary and capture the mapping from the Standard Names to the names used in the Operational Systems. The Data Source Connector template information is then used to automatically create the data extraction logic (ETL code) to retrieve data from the Operational Systems and update the data warehouse.

OLAP Cube Measure Group Templates are built using the same Standard Names as used to define the Data Source Connectors. The Measure Group Templates capture the Fact and Dimension Model and the Business Logic for the calculated measures and KPIs.

Profitbase templates include:

**Finance:** Track and analyze profit and loss, trial balances and departmental spend and much more. Standard key figures and KPI's include Revenue, Day – Bank Overdraft, Equity Rate, Gross Profit Margin, Stock Turnover, EBITDA, Profit, and Salaries versus Profit.

**Inventory:** Track and analyze inventory levels, cost, turnover, inflow and outflow by location, product category, product for the current year or any prior year and much more.

**Purchase:** Track and analyze analytics associated with information related to order and order details and metrics on average lead-time, number for physical deliveries by Purchase Amount, Purchase Quantity, Unit of Measure Code, Company, Currency, Purchasing Agent, and much more.

**Account/Receivable:** Track and manager receivables using metrics including: Amount; Amount Due; Amount Overdue; Invoice Amount; Payment; Number of Credit Days; Delay; Number of Transactions; Days Sales Outstanding (DSO); etc, using dimensions like Customer; Department; Project; User-Defined Dimensions; Credit Category; Payment Category; Transaction Type; Status; and Time Range.

**Category Management / Article Sales:** Track and analyze sales and gross profit by year, month, week, day, store, department, category, item and much more.

**Frequency Analysis:** Track and analyze sales, number of customers, articles per customer, day of week and time of day with trends, week, month or year and more.

**Tender and Cashier/Clerk Analysis:** Track and analyze sales by payment method, by store, by cashier/clerk, number of transactions by payment method, number of error corrections, voids, cash count at day end, and more.

**Promotion Sales:** Track and analyze sales and gross profit by promotion by products by year, month, week, day, store, department and product line and much more.

**Efficiency:** Track and analyze hours worked, sales and gross profit / hours worked, salary against sales and gross profit by year, month, week, day, store, and department and much more.

**Data Source Connectors:** Profitbase has many of the most common data source connector templates that include the mapping from the domain templates noted above to specific business systems including: Microsoft Dynamics™ AX, GP, SOL, NAV, Retailix StorePoint, Fujitsu Global Store, Wincor Nixdorf TP.net and LS Retail for Dynamics AX & NAV.

Once templates are deployed in a Profitbase solution, they are easily modified to meet the retailer's unique requirements through configuration, not programming. And new business system Data Source Connectors are easily created using the drag and drop mapping features of Profitbase Studio, again with no programming.

## Standards Drive Value – Templates Capture Value

In the end, the retailers who have a BI system are connected to their stores and customers. They are able to achieve a much higher level of understanding of their business and can make better decision faster to improve operational efficiency, reduce out of stock situations and plan better promotions. In summary there are able to:

- Predict buying trends
- Plan more effective promotions
- Optimize staffing levels
- Track store performance
- Monitor benchmark objectives
- Identify and remedy cashier problems
- Identify pull-through merchandize
- Compare performance from year to year or store to store

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ARTS Data Warehouse for Business Intelligence (BI), v 1.6 - March 1, 2008  
ARTS Retail Data Model Logical View, v 5.1.0 - June 30, 2006

### **About NRF ARTS**

The Association for Retail Technology Standards (ARTS) is an international membership organization dedicated to reducing the costs of technology through standards. Since 1993, ARTS has been delivering application standards exclusively to the retail industry. ARTS has four standards: The Standard Relational Data Model, UnifiedPOS, IXRetail and the Standard Requests for Proposal. Membership is open to all members of the international technology community- retailers from all industry segments, application developers and hardware companies. [www.nrf-arts.org](http://www.nrf-arts.org).

The National Retail Federation is the world's largest retail trade association, with membership that comprises all retail formats and channels of distribution including department, specialty, discount, catalog, Internet, independent stores, chain restaurants, drug stores and grocery stores as well as the industry's key trading partners of retail goods and services. NRF represents an industry with more than 1.6 million U.S. retail establishments, more than 24 million employees - about one in five American workers - and 2007 sales of \$4.5 trillion. As the industry umbrella group, NRF also represents more than 100 state, national and international retail associations. [www.nrf.com](http://www.nrf.com).

### **About Profitbase**

Profitbase is a technology leader in delivering rapidly deployed business intelligence (BI) and planning solutions to retailers, healthcare providers, manufacturers, and many other markets throughout the world. Their solutions include software tools and out-of-the-box capabilities that enable deployment times, cost and risk to be significantly reduced. Their solutions provide businesses with one consolidated view of information resulting in 360 degree visibility to all aspects of business performance and accelerate planning cycles enabling users to plan, track and act on performance based on their roles in the organizations.

Profitbase solutions also ensures continuity of business insight as new business systems are added through acquisition or system upgrades, protecting a company's investment in existing business systems and turning the hard to access data they hold into an asset. Businesses that deploy Profitbase solutions have access to better, more current information enabling them to be more agile and to make better and faster decisions.

Profitbase is a Microsoft Global Alliance Partner, a NRF ARTS member and chairs the ARTS Data Warehouse committee.

To learn more about Profitbase visit their website at [www.Profitbase.com](http://www.Profitbase.com).

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