

# Global Single Schema

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## INTRODUCTION

Maximizing business process efficiencies in a heterogeneous environment is very difficult. The difficulty stems from the fact that the various applications in the IT environment employ different integration standards, different message passing strategies, and different workflow engines. Vendors such as Oracle and others are delivering tools to help IT organizations manage the complexities introduced by these differences. But the one intractable problem impacting efficient operations is the fact that applications have different definitions for the same business data.

Business processes span these applications. Data problems break these processes rendering them far less efficient than they need to be to achieve corporate goals. Thus the expected return on the investment in these applications is never realized.

The success of all business processes depends on the availability of accurate master data. Therefore, the solution to this problem is to consolidate all the master data a company uses to run its business. Until now, this obvious solution has been impossible to achieve for three reasons.

1. The platforms for supporting all operational application data in one place did not exist.
2. The integration standards and metadata management needed to connect master data to the enterprise were rudimentary.
3. No single software vendor had defined a schema sufficiently broad and deep enough to serve as a master superset to all other data models deployed in heterogeneous IT environments.

Today, the situation has changed. Oracle can create and maintain accurate and consistent master data across heterogeneous IT systems. To accomplish this, Oracle has developed three key technologies that provide a way to consolidate and integrate master data without having to replace investments in existing infrastructure. Individually, each of these technologies brings real business value. In combination, the return on investment is increased by orders of magnitude.

**It is far more expensive to attempt to clean, organize, and integrate data sources on the fly without referring to an established data model.**

**Technology investments are made for business reasons and need to have a tangible value.**

- First, Oracle 9i Real Application Clusters (RAC) effectively deals with the operating platform problem. RAC combines multiple computers into one system utilizing high speed interconnects for parallel cache memory management. With all the critical corporate master data in one place, extremely high availability becomes mandatory. With RAC, should any computer in the cluster fail, work is seamlessly distributed to remaining computers. Very high availability is assured. Oracle itself is using this database platform technology to consolidate hundreds of instances around the world.
- Second, Oracle 9i Application Server (9iAS) Integration has made significant advancements in Business Process Integration (BPI). BPI enables functional integration across segregated business units, extends vertical process management into supply and distribution chains, and provides companies with e-business integration capabilities. Utilizing open standards, web services, process integration, packaged adaptors, and metadata management, 9iAS Integration provides a powerful and easy to manage integration hub to effectively and efficiently connect consolidated master data to the entire enterprise.
- Third, Oracle 11i eBusiness Suite schema represents the final revolutionary breakthrough that allows for true master data consolidation. The 11i schema was built and deployed to support all applications from Supply Chain Management (SCM) to Enterprise Resource Planning (ERP) to Customer Relationship Management (CRM). It defines all the key business objects including Customers, Suppliers, Accounts, Products, Services, Installed Base, Corporate Assets, and Inventory to name a few. This 11i schema is in production at over 6,000 sites in every industry in every country in the world.

In this whitepaper, we will discuss the business process automation that drives improved efficiencies and the data schema that models the key business entities under these processes. We will demonstrate that the models are broad and flexible enough to represent your business. Then, building on this foundation, we will show how these business objects can be populated and managed as the central master data for your corporation in its present heterogeneous environment. Throughout this paper, we will discuss the tremendous business advantages this consolidated master data will bring to your business operations.

## DATA MANAGEMENT

Data management is Oracle's core expertise. Oracle was born by managing data better than any other company in the world. Schema is an organizational layout of data for relational database management. If the schema maps to the way you do business, it can support the applications you use to execute your business processes.

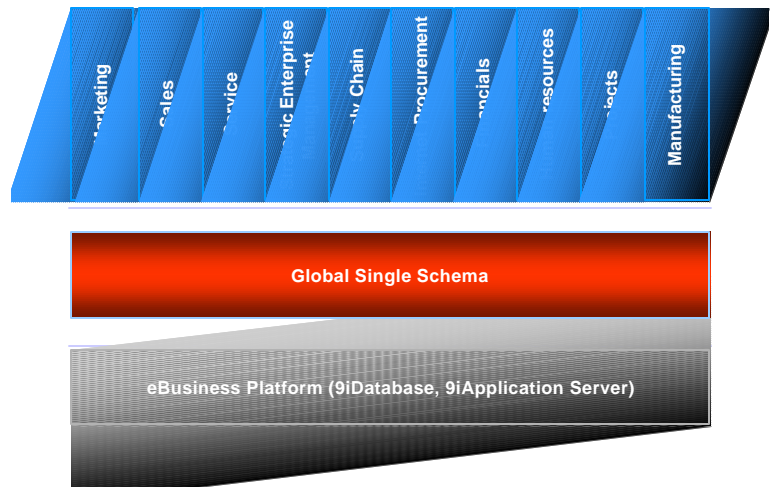
A 'good' data model maps to the way you actually do business.

Schema is another name for data model. The data is your business information codified for computer programs to use. A good data model will represent the way your company does business. For example, if your customers can have more than one account, a good data model for 'customers' will map one or more accounts to each customer.

The computer applications your company deploys to improve operational efficiency are built to operate on the business data organized into this schema. If the schema does not represent how you do business, the applications on that schema cannot provide the features you need to achieve the desired efficiencies. For example, if the 'customer' schema does not allow for more than one account per customer, then the function to create multiple accounts cannot exist in the application that runs on the faulty model.

### Oracle's Unique Position

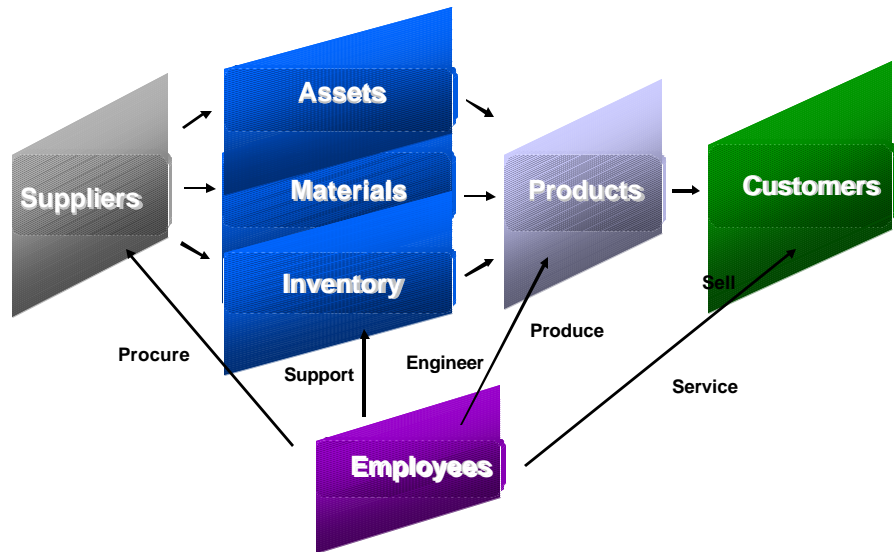
Oracle is in a unique position in that it has developed the relational database engines under the schema and it has developed the operational applications over the schema. This combination created a nexus of expertise unique in the business information industry. Oracle has leveraged this unique combination to create a master data model, a Global Single Schema (GSS), capable of supporting all aspects of your business. The following figure illustrates the strategic positioning for this schema in the Oracle 11i eBusiness Suite.



**Figure 1 – Global Single Schema and the 11i eBusiness Suite**

### Business Process Automation

eBusiness is about maximizing operational efficiency. At the highest level, these 'operations' span all that you do as a corporation. The following figure illustrates some of these high level business processes.



**Figure 2 – Enterprise Business Processes**

Supplies are procured. Assets are maintained. Materials are stored. Inventory is accumulated. Products are engineered. Products are produced. Products are sold. Customers are serviced. And across this entire spectrum, Employees do the procuring, supporting, engineering, producing, selling and servicing. Not shown, but not to be overlooked, are the General Ledger and the financial processes associated with all this procuring, manufacturing, and selling activity.

Consider Oracle's own experience. As an application suite and solutions provider, Oracle has developed over 900 business flows for automating business processes across 19 industries. Over 95% of these flows involve multiple applications. A few examples help illustrate this key point:

- **Catalog to Assembled Content** - This flow contains business processes for creating a product catalogue, setting up a targeted storefront, and assembling content components associated with

All significant enterprise business processes flow across application boundaries.

the products. It crosses iStore, Inventory, and Order Management

- **Customer Return to Settlement** - This flow details the process of the customer requesting an RMA, returning the goods, and receiving a replacement or credit to their account. It crosses Financials, Inventory, Installed Base, Order Management, and Warehouse Management.
- **Execute Field Service** - A field technician is dispatched and performs a service request utilizing spare parts for complex equipment. It crosses Service, Spares Management, Inventory, Installed Base, and Order Management.

### Supporting Data

Supporting all these applications is the data: Customer, Account, Product, Inventory, Installed Base, Assets and more. When this data is fragmented and inconsistent, the business processes fail. But imagine having all the data under these operational business processes in one place. The same accurate and timely customer data will be provided to all your operational applications from the call center to the point of sale. The same accurate and timely supplier data will be provided to all your operational applications from supply chain planning to procurement. The same accurate and timely product information will be available to all your operational applications from demand chain planning to marketing. You would have a single version of the truth about your assets, financials, inventory, customers, suppliers, employees, products and services to support your business automation processes as they flow across your business applications. All company and partner personnel will access the same exact view of every key data entity across all your channels and across all your lines of business. Oracle's Global Single Schema enables this vision of a single version of the truth throughout the operational applications supporting the entire enterprise.

Fragmented data leads to lost time, high cost, and poor quality.

Consolidated data leads to real time, low cost, and high quality.

### GLOBAL SINGLE SCHEMA

Oracle's Global Single Schema organizes hundreds of thousands of attributes into 165 major schema objects supporting over 180 business application modules.<sup>1</sup> It is designed for international operations, and extensibility. The schema is delivered with a full set of public Application Programming Interfaces (APIs) to enable operations in heterogeneous IT environments. All key tables are constructed with additional user defined fields with processes to connect them to a User

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<sup>1</sup> Oracle 11.5.8 electronic Technical Reference Manual (eTRM)

Interface. This enables model extensions that reflect business entities unique to your company's operations. The schema is multi-organization enabled so data manipulation can be controlled along organizational boundaries. It uses variable byte Unicode to support over 29 languages. It encodes flexible date and flexible address formats for easy localizations. If your business is multi-national, or if you work with customers and suppliers who are international, Oracle's Global Single Schema can hold your business objects and support your global operations.

The Global Single Schema supports all customer facing applications, financial applications, human resource applications, manufacturing applications, and engineering applications. The following sections will examine the unique quality of the Oracle Global Single Schema for a few key illustrative business objects: Customers, Suppliers, Employees, Accounts, Products, Services, Installed Base, and Assets.

#### **Customers, Suppliers, Employees & Accounts**

Oracle has developed a Trading Community Architecture (TCA) to model all participants in your daily business operations. It models people, organizations, groups, customers, contacts, employees, and suppliers. It models their accounts, locations, classifications, and preferences. And most importantly, it models the vast array of hierarchical and matrixed relationships that exist between all the participants in your real world operations. The model logically separates people and organizations from their relationships and accounts. This separation creates flexibility unmatched in the industry and accounts for the fact that the Oracle schema for Customers, Suppliers, and Accounts is a true superset of the wide variety of commercial and home grown customer models in existence.

The customer schema is packaged and sold as the Oracle Customer Model together with a full set of APIs and Web Services. In addition, customer data management and data quality management tools are available with the Oracle Customers Online product and the Data Librarian option. This package constitutes a true Customer Hub and includes data load, data cleansing and data enhancement capabilities. In fact, data enhancement includes full Dun & Bradstreet (D&B) integration where the D&B model is a full subset of the Oracle schema.

#### **Products & Services**

The Oracle Global Single Schema includes a number of entities that define the products and services a company creates and offers for sale. Key entities include Items organized into Catalogs and Price Lists.

The Catalog structures provide for the ability to capture different views of a product such as engineering, manufacturing, and service

which are based on a unified product model. As a result, designers, manufacturing engineers, purchasers and partners can work simultaneously on a common product definition. The Catalog schema allows for unlimited attributes, combines them into meaningful groups, and maps them to catalog categories to track these different types of information. The model also maps an unlimited number of functional structures for each item. For example, multiple BOMs can be constructed representing requirements BOM, features BOM, and parts BOM for an item. The Catalog model also supports hierarchical information about an item.

Price lists contain the basic information that associates price and currency with an item, service, group of products or services. Oracle pricing schema is designed for maximum flexibility incorporating several unique characteristics such as 'Qualifiers' and 'Modifiers' to basic lists which already possess the ability to define unlimited numbers of pricing attributes. A price list is mapped to many pricing Modifiers providing discounts, free goods, or other benefits. A price list and its modifiers are mapped to many pricing Qualifiers providing the necessary information about when it is appropriate to use a price list or a price modifier. This enables a Qualifier to qualify multiple price lists and modifiers. It also enables qualifying a price based on any attribute of the customer or any attribute of the item master.

### **Installed Base**

Oracle Installed Base (IB) provides comprehensive life-cycle product (Item Instance) tracking of products and assets, covering multiple configurations, parties, locations, and history. IB is the schema that ties all the products and services a company produces to all the customers who purchase those products and services. The schema is a repository of Item Instance information for both tangible (e.g. computers and engines) and intangible (e.g. licenses and communication services) products. IB can also include Assets as item instances and associate them to corresponding fixed assets in the Asset schema described below. IB maintains a unique and flexible item instance to item instance relationship to represent assembly-component structure as well as inter-item instance connections and business party relationships such as owner, customer, leasee, and lessor information.

Supporting state-of-the-art customer service functionality, Installed Base is unique as a unifying schema. It must connect to suppliers, inventory, work in process (WIP), repair, and order management structures because purchased products may be in any number of states and locations: procurement; warehouse staging; in-transit; at-repair; or

in customer's possession. In addition, integration with 'contracts' allows entitlement coverage to be monitored.

Oracle Installed Base is in production supporting Oracle Service applications, unifying customer interaction channels, and enabling quality self service at over 700 sites worldwide. Oracle itself is utilizing IB to service its customers and over 40,000 employees.

### **Corporate Assets**

Corporate assets have a wide variety of meanings from the narrow definition, as anything that needs maintenance, to the more general definition, as anything you want to keep track of: where it is, how long it has been there, or what it costs to have it there. Real estate would fall into the broader definition, as would everything from the art on the walls at headquarters to primary production line machinery. Oracle has developed a model for assets that covers this entire spectrum.

The Oracle Asset model is a flexible definition with asset groups and attributes that uniquely define asset characteristics. The number of asset attribute elements and values are unlimited. Standards are inherited throughout an asset group. Links to the enterprise and searchable characteristics such as nameplate and engineering specs are included. The model includes asset costs and work history. Also included is a default master Bill of Materials (BOM) for each asset with the flexibility to edit the BOM as different assets are assigned. The model is designed to create a network of assets or routings that combine several assets to a single work activity.

Maximizing asset utilization while minimizing asset maintenance costs can significantly improve the bottom line. Oracle itself is expecting to save \$2.5 million per year utilizing the Oracle eAM product supported by the asset data model schema.

### **BUSINESS PROCESS FLOW ACROSS OBJECTS**

Each business entity codified into a centralized master data environment significantly improves the efficiency of the automated business processes that use the consolidated data. When all the key business entities used by a corporate process are so consolidated, the advantages are multiplied. The key reason for business process breakdowns (data errors across application boundaries) is eliminated. All processes are positively impacted and business process automation is itself automated.

**Fragmented dirty data kills business process automation.**

As an example, Engineering & Manufacturing processes run on E&M data. Consolidated and cleansed E&M data will significantly improve these processes. But these processes also depend on Supply Chain data, Sales data, Procurement & Sourcing data, and Financials data. Errors in these other siloed data stores will break the manufacturing process flow. On the other hand, if all these entities are also consolidated, cleansed, and connected to the enterprise, the business flows uninterrupted.

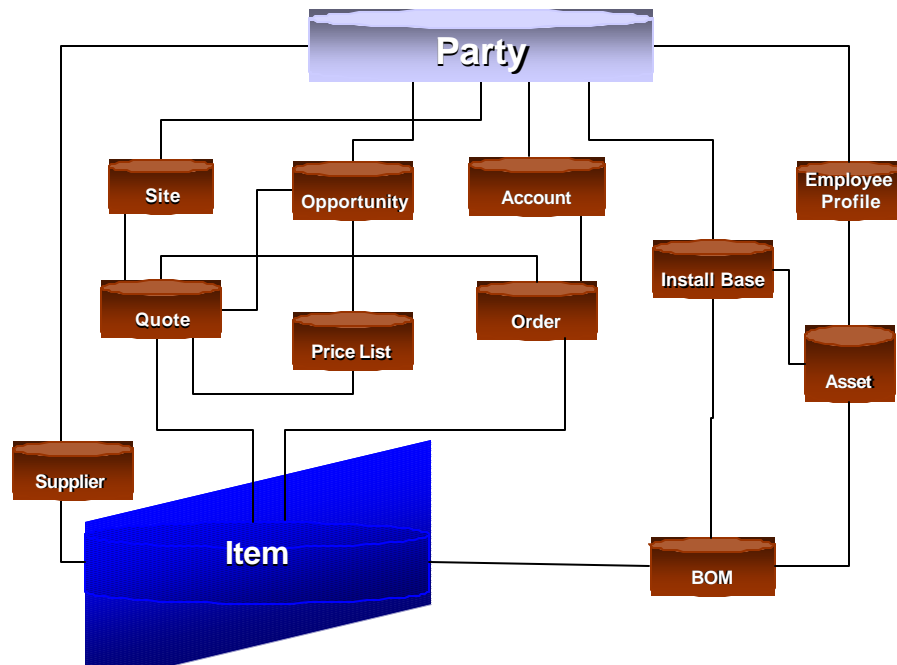
Asset schema integration with the enterprise is another example. Maximum business efficiency in production requires that every asset in the chain run at specific capacities at specific times. Therefore, planning asset maintenance requires data on production plans. The asset schema must be linked to production schedules data. Maximum personnel utilization in maintenance requires that the right person with the right skills is sent to the right asset, at the right location, at the right time, with the right tools, the right materials, and the right instructions to get the job done completely and safely. To achieve this goal, asset schema must be linked to employee skills schema.

**Business entity integration is a key to achieving maximum ROI.**

Oracle's Global Single Schema identifies and defines the business objects an enterprise needs within the context of its business operations. The interrelationships between the business objects are also contained within the GSS data model. Their presence expresses fundamental business rules for the interaction between business objects. The TCA schema represents a good example of the depth of interactions between data entities supporting business processes in the 11i Global Single Schema. TCA entities are referenced over 3,000 times by over 100 other subsystems. These include – Sales, Accounts Receivable, Service, Marketing, Contracts, Supply Chain, E-Commerce, Order Management, Global Accounting, Enterprise Data Warehouse, Business Intelligence, Process Manufacturing Financials, Inventory, Assets, Shipping, Collections, Banking Center, Student System, Training, HR, Projects, Property Manager, Quality, Pricing, and the Interaction Center.<sup>2</sup> Figure 3 illustrates some of these connections.

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<sup>2</sup> Oracle 11.5.8 electronic Technical Reference Manual (eTRM)



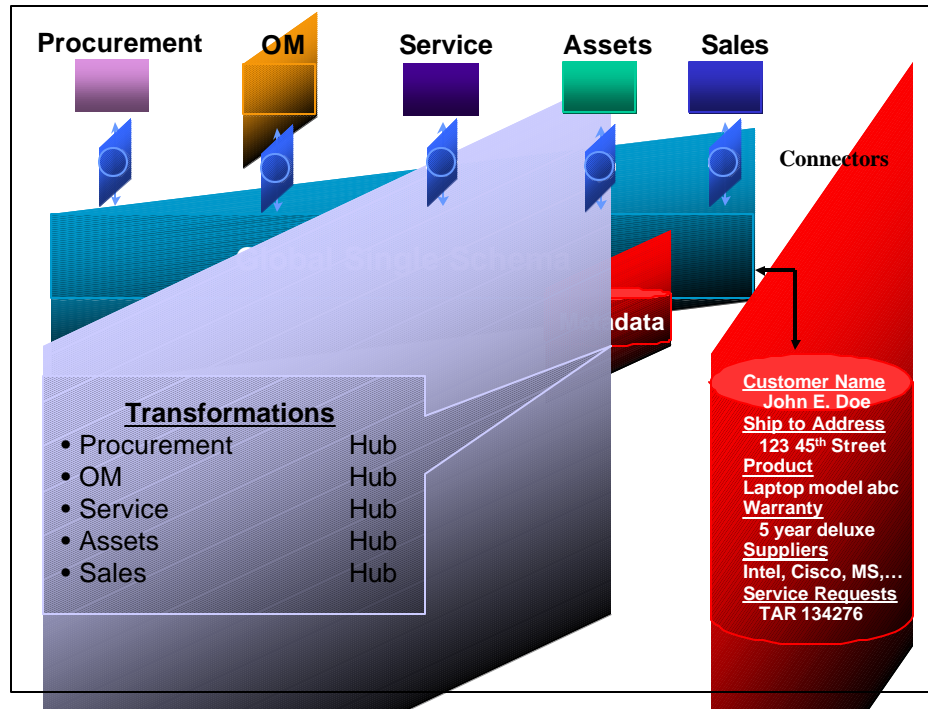
**Figure 3: Interconnected Business Objects Example**

### CONNECTING MASTER DATA TO THE ENTERPRISE

Maximum efficiencies are realized when all applications utilize the consolidated master data directly. But such homogeneous IT environments are rare. To allow maximum use of existing IT infrastructure and application landscapes, Oracle provides all the tools needed to connect the Global Single Schema to the heterogeneous enterprise.

Integrating consolidated master data into all the corporate systems is a competitive key for companies looking to achieve higher customer satisfaction, uniform product information, and maximized corporate asset utilization. 9iAS Integration links the consolidated master data to heterogeneous systems regardless of platform or vendor and provides sophisticated content sensitive routing, message handling, and mappings for distributing information.

Figure 4 illustrates Global Single Schema master data connected to the enterprise via 9iAS Integration Services.



**Figure 4: Global Single Schema Integration**

Oracle 9iAS Integration employs a hub and spoke architecture that supports point-to-point, publish & subscribe, and broadcast messaging paradigms. All information about each transformation between spokes and the Global Single Schema in the hub are controlled by metadata. An easy to use visual metadata manager is provided. This ensures consistent mapping of data elements and business objects throughout the enterprise. Note also that the connectors in Figure 4 manage a single transformation between data in the spoke applications and the master data in the hub. This greatly simplifies the data management problem created by countless data element transformations as business processes traverse applications.

A design that reduces complexity is superior to a design that manages complexity.

Oracle 9iAS Integration consists of three key components:

- 9iAS J2EE Container
- 9iAS InterConnect
- 9iAS ProcessConnect

9iAS J2EE Container provides the open virtual machine supporting horizontal standards such as Java Connector Architecture (JCA), Java Message Services (JMS), Web Services, SOAP, ebXML, UDDI, and WSL. Industry specific standards such as RosettaNet, HL7, and EDI and are also supported. Design tools are provided to build out to other standards. These open standards dramatically simplify implementation in any heterogeneous IT landscape. 9iAS InterConnect is the

Enterprise Application Integration (EAI) product implementing an application to application hub and spoke design with a metadata manager to easily manage the hub information. In addition, adaptors are provided for connecting to technologies such as IBM MQ Series, SMTP, and Tuxedo as well as application adaptors for SAP, PeopleSoft, Siebel, and JDEdwards. A Software Development Kit (SDK) is also provided for interfacing to home-grown and legacy applications not supported out of the box. 9iAS ProcessConnect adds process integration with Process Monitoring, Activity Monitoring, and Process Optimization.

### **AN EVOLUTIONARY APPROACH**

Some companies are converting all applications to Oracle, leveraging the full 11i eBusiness Suite to gain the maximum possible operational efficiencies and business intelligence. For most corporations, a re-implementation of all operational applications at the same time is unrealistic. For these companies, a staged evolutionary approach is superior.

The staged approach involves consolidating some master data and growing the number of business objects consolidated over time. Once the business data to be consolidated is identified, all instantiations of it across the IT environment must be located; the optimum implementation of the master model for the object must be crafted into the Oracle Global Single Schema; the transformation for each instantiation must be configured into the 9iAS metadata; and finally, the data must be populated in the master. Once populated, the consolidated data can be cleansed and enhanced.

The order in which objects are consolidated will depend on the nature and size of the business problems addressed. For example, if a communications company is having serious problems standardizing its products and pricing across multiple billing engines, consolidating the product catalog might be the best first step. Many companies are consolidating customer information into the Oracle Customer Hub. This approach has an added advantage in that customer satisfaction levels can rise dramatically even as the operational costs are reduced.

### **DATA MANAGEMENT INTEGRATION**

Data Management Integration (DMI) attempts to integrate the management of distributed data rather than integrating the data itself. Master Data Consolidation (MDC) consolidates the data into one place and integrates the applications with the consolidated data. For smaller companies, with fewer than a dozen applications to integrate, DMI is an

attractive option. In fact, with fewer than 3 applications, even point-to-point direct connection between applications is a viable option. Oracle fully supports these options with 9iAS. But for more than a dozen applications, the MDC architecture is far superior, because it eliminates complexity rather than trying to manage it. As we have discussed, Oracle Global Single Schema is an MDC architecture.

**You can't run  
an e-business  
on fragmented  
dirty data.**

## **CONCLUSION**

According to a Data Warehouse Institute study, poor data quality costs businesses billions of dollars each year<sup>3</sup>. This large monetary figure includes the cost of business process breakdowns and the IT cost to fix them. It includes the cost associated with the erosion of an organization's credibility with customers and suppliers. It also includes the cost associated with the inability to make sound business decisions based on accurate information. Consolidating master data utilizing Oracle's Global Single Schema solves this serious IT problem, allowing IT organizations to redirect their resources to realizing their 'Mission' instead of constantly allocating their resources to undoing the damage caused by these data quality problems.

Real master data consolidation enables true end-to-end business process integration. Data maintenance costs are dramatically reduced because the global master data resides on one Global Single Instance. Real time analytical data and true business intelligence is available in the vast amount of accurate real time master operational data. Reports can be collected and delivered from the operational data reducing the need for large and costly data warehouse implementations.

If a company centralizes all its master data, manages it professionally, provides effective governance, and connects it to their enterprise, the company will dramatically improve supply chain management, enterprise resource planning, asset utilization, and customer satisfaction levels. These benefits accrue to all areas of the business. The effectiveness of all employees and business processes will improve. Oracle, with 11i Global Single Schema and the 9i Database and 9i Application Server platform, has a unique and proven set of technologies and tools that enable this strategy. This consolidation will create an order of magnitude improvement in a company's operational efficiencies making it a true eBusiness.

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<sup>3</sup> "Data Quality and the Bottom Line" by Wayne W. Ekerson, [www.dwinstitute.com](http://www.dwinstitute.com)



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