

Oracle Information Architecture: Better Information for Better Business

*An Oracle White Paper
April 2004*

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EXECUTIVE SUMMARY

Today, the most valuable assets of a typical enterprise—intellectual property, human expertise, and business processes—are information-based. Yet enterprise systems are designed primarily to manage physical and financial assets such as equipment, inventory, and cash. By better managing information assets, enterprises can improve business performance and flexibility, lower risk, and increase profitability.

Oracle has developed a next-generation architecture for managing all of your enterprise information. The Oracle Information Architecture enables you to have a single source of truth for all business-critical information; continually optimize your business processes and IT infrastructure as your needs change; and provide a unified workplace where employees, partners, suppliers, and customers can use and share information.

DEFINING INFORMATION ASSETS

Information technologies have dramatically changed the structure of organizations, with information assets becoming the primary source of value. Traditionally, we think of physical manufacturing assets as drivers of economies of scale and increasing profitability. Greater factory output equals potential for greater efficiencies. But traditional economies of scale based on manufacturing have limits. Once a system becomes too large to easily control, scaling up further actually decreases efficiency.

Information systems change this equation. Through better information and control, physical assets can achieve further scalability and greater economies. And information itself, such as patents or copyrights, proprietary customer lists, and novel business processes, can become an asset.

Patents, copyrights, and proprietary formulas are examples of innovation-related information assets that add to market value. Research and development (R&D) introduces new products that can increase profitability. However, developing new products isn't the only, or even the most important, way to increase information-based capital assets in enterprises.

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Another information asset, human expertise, can be an even greater value creator. Modern organizations are not only more connected than their industrial-era predecessors but also more dependent on their employees, suppliers, and partners, whose skills and knowledge are often irreplaceable.

Organizational capital in the form of business processes has also proven to deliver a significant sustainable competitive advantage. Many companies such as Dell Inc., Wal-Mart, and Procter & Gamble have achieved significant competitive advantage and profitable growth through better business-process management and full utilization of their information technologies.

BENEFITS OF GOOD INFORMATION MANAGEMENT

Well-managed information assets in the form of knowledge shared between workers and improved business processes can provide better visibility into the status of your business, as well as greater flexibility for changing your business. Information assets also have the scalability to drive higher margins and profits than physical assets can deliver.

Greater Business Visibility

Traditional reporting methods create a sea of information, with delays in research and reconciliation. Better business processes enable management to develop insight and take action. Improving decision-making processes benefits every part of the organization. The result? Your organization is more attuned to real metrics, because all employees are empowered with timely information that meets your problem-solving needs.

More Business Flexibility

As the adage goes, the only constant thing is change. A business must constantly improve, adapt, and respond to the market to succeed. Management must resolve competing priorities such as meeting regulatory requirements, responding to competitive pressures, and hitting profitability targets. To succeed, individual departments need to upgrade their service levels and adopt the best operational and management practices. At the same time, the business needs to scale, by aligning and unifying global operations. Unified business operations make it possible to bring new products to market faster, launch new distribution channels, and respond quickly to pricing pressures.

Better Margins and Profits

Most physical assets can be used for only one thing at a time, significantly restricting their scalability. In contrast, the virtual nature of information assets means they can be used for many purposes at once. A patented concept may have several different uses and ways to generate profit. This scalable reuse of information assets can lead to significantly better margins and profits, because the potential value of an information asset is limited only by the size of the market.

Every dollar of investment in knowledge can add to an organization's productivity, whereas most investments in buildings and equipment simply replace depreciated assets, contributing no new value to the organization.

Information assets also often have nearly unlimited scalability. An organization's knowledge pool accumulates, each idea building on the one before it. On the other hand, most physical assets deteriorate and must be replaced. Every dollar of investment in knowledge can add to an organization's productivity, whereas most investments in buildings and equipment simply replace depreciated assets, contributing no new value to the organization.

A third advantage of information assets is positive network impact. Information-driven markets increase with the size of their networks. The more an information network grows, the more successful and expansive it becomes. A technology that gains an initial small advantage can quickly dominate the market. Customers, typically conservative in their technology investments, are drawn to market leaders. The benefits of information assets have driven the market dominance of many information-intensive enterprises. For example, in 2003, Microsoft sold more than 90 percent of personal-computer operating systems and eBay conducted 85 percent of online auctions in 2000. This kind of market dominance is rarely found in physical-asset-intensive industries, where highly efficient and well-managed enterprises such as Exxon, General Electric, and Toyota have a market share of less than 25 percent.

An Example of Good Information-Asset Management

A recent *BusinessWeek* article¹ described Dell's mission to build and sell popular computing products more cost-effectively than any other vendor. Dell's core strength is its exceptional efficiency in manufacturing and distributing inexpensive desktop computers, servers, and data storage equipment. The company, whose market share has grown from 10.6 percent in 2000 to 15.2 percent in 2002,² has become the world leader in a highly competitive market.

Dell's strategy is to apply its real-time customer- and operations-management skills to commodity markets for standardized technology. In this pursuit, Dell has refined its operations with hundreds of business-process patents, including order preparation, shipping, and a method for providing customer-configured machines on its Web site. Dell maintains greater margins than the competition while building share in volume markets and generating higher profits.

¹ Andrew Park and Peter Burrows, "What You Don't Know About Dell," *BusinessWeek*, November 3, 2003.

² Dell Inc., <http://www1.us.dell.com/content/topics/global.aspx/corp/background/en/facts?c=us&l=en&s=corp&~section=002>.

5 billion gigabytes of new data were created in 2002, a 30-percent increase from 1999.

—*How Much Information? 2003*, U.C. Berkeley School of Information Management and Systems, October 2003.

THE RISKS OF POOR INFORMATION ASSET MANAGEMENT

Information assets are growing at a phenomenal rate. According to a study by the University of California at Berkeley, 5 billion gigabytes of new data was created in 2002 alone—enough new information to fill the U.S. Library of Congress 500,000 times over, and a 30 percent increase since 1999. In addition to stored data, UC Berkeley measured the electronic flow of new information at 18 billion gigabytes.³

In this sea of data, only timely, accurate information helps organizations manage assets, and poor information creates significant risks. The challenge for organizations is to build systems that can connect people, manage business processes, and deliver information effectively.

The most commonly recognized concern is regulatory compliance. Poor information-asset accounting systems make flawed—and even fraudulent—financial reports more likely. Executives cannot rely on accounting-based information alone to monitor the enterprise, because these systems measure only physical and financial assets. Regulatory compliance demands careful control over information assets as well. Lack of controls on business processes and collaboration processes can result in expensive penalties; earnings restatements can lead to falling share prices.

An organization that cannot track its information assets runs the risk of not being able to promote the value of those assets to the investment community. Deficiencies in information disclosure to capital markets, particularly pronounced for information-intensive companies, result in excessive cost of capital. This, in turn, hinders business investment and growth and can mean a lower enterprise valuation.

Finally, an organization that cannot track its information assets is limited in its ability to trade those assets. Fully exploiting information assets may mean packaging, categorizing, and marketing them. A single, enterprisewide information system can manage assets more effectively than separate systems. With it, your organization can exercise more control over assets, reduce risks, and provide better market mechanisms for trading its information assets.

An Example of Poor Information Asset Management

The Wall Street Journal reported the case of a Philips Semiconductor plant that caught fire and shut down for six weeks, wreaking havoc on supply chains and altering the competitive positions of two of the cellular telephone industry's biggest players, Nokia and Ericsson.⁴

³ *How Much Information? 2003*, U.C. Berkeley School of Information Management and Systems, October 2003.

⁴ Mark Toszczak, "Expecting the Unexpected: The Strategic Implications of Supply Chain Disruptions," *Alumni Magazine*, University of North Carolina Kenan-Flagler Business School, Fall 2003.

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Nokia and Ericsson had different responses to the fire. Nokia quickly noticed the problem in its chip supply, requested production increases from alternative suppliers, and redesigned chips to reduce its reliance on Philips. In contrast, one top Ericsson executive didn't even learn about the fire until more than two weeks had passed. And the company's lack of a backup plan meant that it lost 4.5 billion kronor (US\$750 million) or more in potential revenue, according to an estimate by Ericsson executives. The company's share price dropped 14 percent when the market found out about the effect of the disruption, and Nokia made the most of the situation, grabbing market share from Ericsson.

If an enterprise has the right information system, it is able to respond to problems with comprehensive, integrated strategies. It can use alternative suppliers, build buffer inventory, design alternative business processes, manage demand, and even forecast disruption problems before the fact.

THE INFORMATION MANAGEMENT CHALLENGE

If information assets create so much value and significantly reduce risks, why don't all organizations manage them carefully? Some organizations do. Microsoft's net physical and financial assets in June 2000, for example, constituted less than 10 percent of its market value, and Cisco's physical and financial assets accounted for 5 percent of its market value. But these are exceptions to the rule. Most organizations in other economic sectors have significant investments in physical assets, and many are poor in information assets.

Information assets are growth-limited, because they are substantially more difficult to manage than physical or financial assets. The well-defined property rights of physical and financial assets (versus the often hazy property rights of information assets) make managing physical and financial assets easier. The virtual nature of information assets further complicates their management. For example, identifying unused physical capacity and taking corrective actions are straightforward tasks, whereas optimizing network functions after the introduction of a new technology can be quite difficult.

A single, comprehensive enterprise information system designed for all enterprise business processes offers better information-asset management for value creation and risk reduction.

Making information systems available to the widest range of employees, customers, suppliers, and partners can enhance the value-creation potential of all assets. But today's popular approaches to business computing have made the situation even more challenging. Disparate, complex systems have fragmented business processes and information, making it more difficult to manage the enterprise.

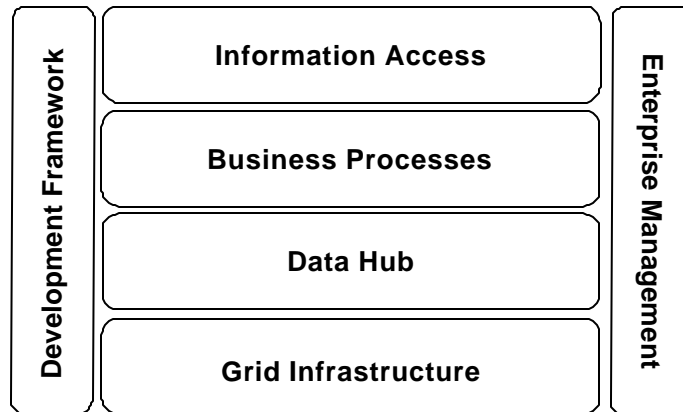
This has occurred, in part, because organizations have many different requirements for business processes. Some are mission-critical, but many others are not. Some business processes are transactional in nature, whereas others are collaborative. Some processes must occur in real time. Geography and organizational functions such as sales, marketing, or manufacturing may come

into play. Mergers and acquisitions can also affect how information systems are managed.

Lack of real-time business intelligence creates an inability to respond to changing business conditions. Manual execution of business processes is inflexible, expensive, time-consuming, and prone to error. Lack of collaboration tools integrated with other applications makes it difficult to track and audit enterprise processes.

THE ORACLE INFORMATION ARCHITECTURE

A single, comprehensive enterprise information system designed for all enterprise business processes offers better information asset management for value creation and risk reduction. Oracle's model for the modern enterprise information system, the Oracle Information Architecture, is based on several key components, as shown in the following diagram:



The Oracle Information Architecture

At the center of the model is a *Data Hub*, which acts as an index of information for the entire enterprise. The *Business Processes* layer enables you to continually optimize your organization through service-oriented applications, integration services, and process-management tools. The business processes layer can tap into the data hub for information when needed. *Information Access* provides integrated access to transactional applications, decision support, and collaboration tools for everyone—anytime, anywhere.

Supporting the entire architecture is a *Grid Infrastructure* that acts as a utility that delivers computing power. There is also a *Development Framework*, for creating applications, and *Enterprise Management*, for managing the entire information system.

Data Hub: A Single Source of Truth

The success of all business processes depends on the availability of accurate master data. A data hub is a centralized repository that provides continuous synchronization of key information throughout the enterprise. Detailed data may be stored in many application-specific databases, but the data hub is the one place to go to find all this information. This enables you to create and maintain accurate, consistent master data about your customers, products, inventory, and other aspects of your organization.

The data hub supports all applications—from supply chain management to enterprise resource planning, to customer relationship management. It defines all the key business objects, including customers, suppliers, products, services, corporate assets, and inventory. The data hub has a full set of public interfaces to work with all your systems and allows you to include other specialized business information unique to your organization's operations. The data hub includes data-quality-management tools for bulk data loading, cleansing, and enhancement. It also provides analytics, which make it easier to understand what's going on in your business in real time.

Business Processes: Optimizing the Value Chain

By quickly and flexibly developing and deploying new business processes, successful enterprises can deliver better value to customers. The key to building a real-time enterprise is optimizing the entire value chain, not just individual process steps.

The Oracle Information Architecture's business processes layer integrates all of your applications, as well as external customer and supplier applications. And the applications can be augmented with velocity-sensing edge technologies such as telematics or Radio Frequency Identification (RFID).

All of these applications can tap into the data hub for information. The business processes layer enables an enterprise to implement end-to-end business processes based on that single set of data. This provides the foundation for effective cross-enterprise business flows in mixed-vendor application environments.

The business processes layer provides global visibility, intelligence, and optimization based on real-time events as well as enterprise information. You can monitor and optimize the performance of your business processes; manage compliance; and maintain service-level agreements with your customers, suppliers, and partners. The business processes layer combines traditional business intelligence, real-time business intelligence, content management, business process management, and more into a single, integrated system.

Information Access: Connecting People, Processes, and Information

The information access layer offers a consistent, Web-based user interface for all business processes: transactions, decision support, collaboration, and content

Only the Oracle Information Architecture integrates Daily Business Intelligence and advanced collaboration tools directly into business processes.

management. All of this is managed through an enterprise portal. Only the Oracle Information Architecture integrates Daily Business Intelligence and advanced collaboration tools directly into business processes. Information is personalized and shared, making your business more productive.

The information access layer integrates auditing and reporting functions directly into enterprise business processes. Daily business intelligence capabilities enable employees to view real-time and historical business data as part of business processes. With unified information access, you can increase productivity and reduce errors by finding, capturing, and sharing valuable business data at the point in the process where it's needed.

Collaboration services are also integrated into enterprise business processes. Users can launch e-mail, voice mail, Web conferencing, and more from within any kind of application. The Oracle Information Architecture works with any device, anytime, anywhere. Whether users are at their desk, on the road, or at home, they can access applications, information, or other people.

Grid Infrastructure: Power When You Need It

Underpinning the Oracle Information Architecture is a computing engine capable of supplying the power needed to manage your information. Grid infrastructure software adapts to your changing business needs. This means that you can spend more time thinking about how to run your business, knowing that the grid computing infrastructure will respond with the reliable, secure performance your applications need. No other software infrastructure can do this.

Grid computing is a fundamentally new computing architecture designed to address utility computing needs. It pools numerous servers and storage devices into flexible resources for all enterprise computing needs. The grid computing infrastructure continually analyzes demand for resources and adjusts supply accordingly.

Grid computing revolutionizes IT economics. Faced with tight budgets, every business needs to cut IT costs, improve staff productivity, and reduce costly downtime. With enterprise grid computing, you can build a powerful infrastructure with a variable cost structure you can adjust as needed. Most applications today use resources from just one server in a single location. When business processes change, new server capacity may need to be purchased, new integration software written, and more testing done. The infrastructure may take a very long time to change to reflect new business requirements.

Grid computing enables an organization to tie its business processes, through service-level agreements, to its IT architecture. It introduces sophisticated workload management capabilities that enable applications to share resources across many servers. Data-processing capacity can be added or removed on demand, and resources within a location can be dynamically provisioned. Web

With enterprise grid computing, you can build a powerful infrastructure with a variable cost structure you can adjust as needed.

services can quickly integrate applications with infrastructure services such as identity management to create new business processes. As a result, your IT infrastructure can respond immediately to changes in your business needs.

Development Framework

The Oracle Information Architecture includes the Application Development Framework (ADF), which provides a productive way for all developers in the enterprise to work together on different aspects of application development. Software components can be developed with consistent standards, making components more reusable and more easily integrated.

Enterprise Management

The Enterprise management layer provides a centralized view of all information systems, so you can easily set and monitor overall service levels for users and applications. This layer automates day-to-day maintenance tasks and provides diagnostics and tuning for the infrastructure. The Oracle Information Architecture's enterprise management enables you to measure quality of service from the user's perspective and drill down to find and resolve problems.

A single, unified enterprise information system can create more value through positive economies of scale, greater business agility, and better information asset management.

CONCLUSION

Information technology changes the business equation. Traditionally, we think of manufacturing assets as the drivers of economies of scale and increasing profitability: Greater factory output means potential for greater efficiencies. A single, unified enterprise information system can create more value, through positive economies of scale, greater business agility, and better information asset management. Oracle has developed a next-generation architecture for managing all your information. Using the Oracle Information Architecture, you can

- Rely on a single source of truth for all business-critical information
- Optimize your business through services-oriented applications, integration services, and process management tools
- Manage all of your business applications—transactional, decision-support, or collaborative—to achieve a predefined service level of performance and reliability
- Provide unified information access for everyone: employees, partners, suppliers, and customers

For more information, visit oracle.com.



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