IDC
Analyze the Future

WHITE PAPER

Information as a Service to the Enterprise

Sponsored by: IBM

Sandra Rogers

December 2006

INFORMATION AT THE HEART OF AN ENTERPRISE

As the old adage says, "Information is power." The ability of an organization to best understand the behaviors and needs of its customers and partners, manage effective processes with timely insight, target new opportunities, and ensure that it is operating in a compliant and financially responsible manner on a day-to-day basis provides a foundation for innovation and success, let alone its survival. And all of these efforts are fueled by accurate and timely information. Thus, it behooves organizations to ensure that their information assets are well organized and clearly defined, readily accessible, and consistently addressed. However, in today's complex and distributed environments, providing that level of coordination and oversight presents an interesting challenge.

Today's enterprises are faced with many of the same traditional forces as in the past, but the volume, complexity, and volatility of external influences have changed dramatically in recent years, adding to the mix. The pace of change is much more accelerated, and what actually defines an enterprise is indeed morphing, becoming more fractured and distributed, with many organizations engaging more third parties and stakeholders within their respective business value chains expanding across the globe. Thus the ability to collaborate effectively within and beyond the supply chain has become both pertinent and at the same time more difficult to manage. In addition, regulatory and compliance requirements continue to build, placing further burdens on business and IT to strive toward greater levels of transparency and control. All of these concerns need to be more readily accommodated in an integrated and proactive fashion rather than via the one-off efforts that most enterprises have historically pursued.

Recent IDC studies with corporate executives reveal their heightened awareness and need for visibility across their respective enterprises, desiring end-to-end views of customer and product-line performance, and to gain greater insights across the business to address risk management. They require access to trusted and reliable information in a timely manner. Many of these executives also highlighted the increasing demands being levied by an overall savvier customer base that harbors heightened expectations around service and innovation; thus they aspire to better understand and tailor all of their enterprises' customer interactions to address satisfaction and unearth opportunities. Meanwhile, others are extremely busy making their companies more efficient and nimble, tasked with rationalizing and consolidating their enterprise activities and eliminating redundancies that have built up over time, whether due to merger and acquisition activities or organic growth.

Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc.com

Trends Driving Interest in Optimizing Information Architecture

Therefore, the driving constant is change, and businesses now must embrace and even capitalize on this inescapable dynamic. A critical step in preparing to do so involves taking a good, hard look at the way systems and processes are designed. Rather than creating solutions geared for discrete applications or processes, this evaluation involves creating and instantiating the core elements and functions of the business in a fashion where they can be utilized in multiple ways as well as in an independent fashion. This implores one to view all of the components of the environment in a logical orientation that is not constrained by any particular physical implementation or use scenario. Thus, application and information architecture has become increasingly important as it represents and becomes more woven into what ultimately defines the business.

Most enterprises are flooded with data and content from many systems and sources, and in multiple forms, with the volume and variability continuing to increase. Each information source is useful in context to its particular initial use case yet can potentially provide tremendous additive value when it is combined and utilized for multiple purposes. However, sharing information and ensuring that the most appropriate views are discovered and used for their intended and changing purposes can be daunting given the many layers of hard-coded and semantic dependencies built within most typical applications and systems.

Addressing Information with a Unified Approach

The desire to consolidate data and content in a harmonized state across the enterprise is not a new aspiration. Various techniques and technologies have advanced over time to address the many activities that are required to move toward such a goal. However, one of the most inefficient and disconcerting issues is that many of these approaches are applied in a very fragmented, redundant, and inconsistent manner. Contributing to this phenomenon is the fact that most IT efforts are undertaken on a project-by-project basis, and once they are in production, over the course of time, significant alterations and additions to applications are made that can further compromise the integrity of the steps undertaken.

Overcoming whatever barriers may exist to allow fluid operations and assessment of the business requires a mechanism to address information consistency and coherence. Applying a common form to all information sources that will be utilized within an enterprise is an impossible feat, especially in large and changing environments. Therefore, applying intermediation to ensure the structure, context, and semantics of information used is the most often sought strategy. However, to date, most organizations have handled many of the steps necessary to achieve this state in a very rigid, manually codified manner.

Change is inevitable; the key is to address it with the least amount of disruption to the existing IT environment and best capitalize on the opportunities it presents. With the uncertainty of the explicit information that may be needed in the future, and by whom and how it will be used, it is critical to build an information foundation that is open, flexible, and scalable. And if common activities associated with access and processing of information can readily be provided as reusable components (or services), one can devote more time to focusing efforts on addressing the targeted information and business use scenarios.

Business and technical information requirements necessitate that an overall information architecture address the following aspects in a proactive fashion:

- **Consistent understanding of what the information represents.** To ensure that all individuals and systems (including parties that create or capture, process, manage, and consume information) are unified with a common vocabulary and understanding of definitions.

- **Flexible and customizable views.** To address a specific party's role or a step within a particular business process, the ability to address information at varied levels of granularity and aggregation is needed. Data formats typically tailored for transaction processing may not readily make sense to users and consuming processes in native form, and thus they need to be adapted to best address varied purposes.

- **Contextualized information delivery.** To deliver and address information "in line" and in context with varied business process and user roles and to provide support for real-time event correlation and alerting to address business and system changes.

- **Data quality and integrity.** To ensure integrity and appropriateness of information for use and for intended purpose; to note, this is especially important given the increasing amount of fiscal and regulatory demands for accurate and auditable information.

- **Flexible design approaches.** To adjust to changing business dimensions and requirements, information services and infrastructure should be constructed to readily adapt; to support changing but traceable relationships between information sources and elements and to support varied system and information types, with considerations on not how information is natively designed but in how it may be used.

- **Performance, reliability, and high availability.** To deliver immediate response and ensure the system is available to meet designated service levels; dependable and scalable performance-sensitive automation of tasks sufficient for heavy and variable workloads is also an important dimension to consider from both business fulfillment and cost perspectives.

- **Streamlined tasks.** To gain efficiencies and ultimately cost savings, the elimination of redundant processes and provisioning of capabilities and tools to help simplify and accelerate development, deployment, and maintenance.

- **Role-based management and administration.** For organizations that require certain levels of autonomy to distributed sites, the ability to support federated management and administration is important.

- **Security.** For addressing risk mitigation, corporate compliance, and overall systems governance, the ability to protect against unauthorized access is necessary.

The idea of creating a data services facility is certainly not a new concept. However, the progress and acceptance of standards (especially XML) in the industry, an increased focus on creating enterprise-scale architectures (especially service oriented architecture [SOA]), and advances in capabilities for model-driven approaches are contributing to it as a viable approach to enterprise data integration and provisioning. Beyond the need for visibility and control, organizations across all industry sectors and size classes are also showing tremendous mindshare and increasing emphasis toward building information "services" that can be exploited as needed.

Addressing Information in a Service Oriented Architecture

Several compelling business drivers are pushing enterprises to adopt SOA; a primary driver is the ability to readily gain access to and correlate information across a variety of systems in a more comprehensive and dynamic manner. Past IDC studies reflect that two of the top reasons for pursuing integration in general are the need for a single point of access to multiple information sources and the need for a unified view of enterprise information. These needs are indeed contributing to the drive toward SOA adoption.

The idea of creating an infrastructure layer that can mediate between providers and consumers of services to manage workflows and enforce business rules and system policies — although not necessary for SOA — is emerging to become a best practice. Organizations are also keenly looking at creating more robust information governance processes that coordinate well within their overall IT and SOA governance programs.

Some example use cases that can capitalize on a well-formulated information architecture and SOA infrastructure approach include support for:

- **Highly diverse information types.** For example, in law enforcement, various forms of data and content from different agencies and institutions need to be tied together quickly, such as criminal and court records, medical and DNA records, travel tracing, immigration status, and more.

- **Highly collaborative environments.** For example, pharmaceutical research often involves the sharing of intensive amounts of complex data both within and beyond these entities' boundaries, including clinical trials, educational research institutions, and product domains.

- **Highly time-sensitive, real-time processing demands.** For example, processing financial trade transactions, fraud detection, call center operations, and credit authorization at point of sale.

- **Highly automated and embedded solutions.** For example, solutions that involve streaming and/or event-centric systems, including but not limited to mobile and RFID solutions, trading, transportation, manufacturing plant floor solutions, and medical systems.

- **Analytical and audit-intensive requirements.** For example, regulatory compliance demands assurances of policy adherence, exception-based processing, and utility metering and monitoring.

- **Dynamic and volatile systems environments.** For example, such environments that demand the ability to introduce or change elements of the infrastructure or applications readily, to capitalize on grid and virtualized infrastructure, or to support rapid merger and acquisition harmonization.

Historically, most applications have been created that are tightly bound to their own database structures and instances of reference data. And if one looks across varied applications and databases, one can often find redundant information that requires physical synchronization or processing to keep all these varied stores up to date and consistent with one another. As a result, there can be times where inconsistencies exist, either temporarily due to a timing consideration or more permanently due to errors in design or processing.

One of the major premises behind SOA is that ideally it should be designed with a separation of services from implementation dependencies (including data sources). However, the service does require interaction with information to maintain state. The realities of exposing existing applications as services that are highly dependent on specific implementations of data sources and platforms increase the risk of producing errors due to inconsistencies and incompatibilities.

A Separation of Concerns

The use of a dedicated information services layer logically provides access, aggregation, and data service operations to enterprise information assets abstracted from physical sources. Reduced reliance on proprietary and custom interfaces and formats promotes greater consistency and thus reusability and flexibility to develop new and changed services in a timely manner.

One of the primary functions of an information services layer is to abstract the complexities and technical dependencies of accessing data from the consuming service. Another added benefit is the protection of source data from inappropriate access or overuse, thus adding another degree of security and performance assurance. And by providing this degree of intermediation and insulation from consuming entities, one can perform maintenance and alterations to the information sources without necessarily disrupting the applications.

A growing need for highly distributed environments is support for both federated query and information access and synchronization capabilities. Many organizations may require a hybrid approach due to business requirements and evolving information management strategies. The basic premise behind federation involves the ability to address multiple resources as if they were one while retaining their

independent integrity and state. This concept relates to approaches that involve abstraction and virtualization techniques such as SOA. The model is intended to simplify source interactions with a single interface and provide a buffering layer between any consuming or provisioning application or source and the varied information sources.

This infrastructure addresses all the varied information types and formats as a "service." It also is used to optimize queries across a distributed environment and minimize the amount of activity and information necessary for fulfilling its task. Today's data services infrastructure solutions often employ advanced caching and take advantage of parallel computing environments. Some are advancing to supply event correlation capabilities.

The primary types of information services to consider are as follows:

- **Business information services** involve routines that deliver and represent views of information for processing purposes.

- **Infrastructure services** apply specific operational routines to the information itself. Capabilities that a software infrastructure provides upon request, including specialized processing services applied to information, include the following:

  - Access, aggregation, and transformation (mapping) services handle access, conversion, and information manipulation routines to provision services based on defined business information service requirements.

  - Query and caching services optimize calls and use of heavily requested information.

  - Information profiling services address data and content quality and ensure use of appropriate information structures, schemas, and vocabularies.

  - Routing and event-based message services perform basic information workflow and triggering (alerting) functions.

  - Cleansing services ensure quality and consistency of defined rules and thresholds to resolve conflicts, redundancies, missing data, and unacceptable values.

  - Authorization (security) services ensure that access rights to specific information conform with defined policies, adding an extra layer of security in a more granular way that addresses specific information independent of system or application.

- **Registry services** publish, discover, and determine how to appropriately reference services including location, input and output parameters, and expected message structure.

Key to providing these types of services is the ability to understand all sources of information, as well as their inter-relationships, dependencies, and state. Thus, creating a view of information through models is a critical part of the underlying mechanism fueling this approach. Therefore, other important architectural considerations that support a unified information management approach include:

- **Metadata management and repository services** document, organize, and understand services and related systems artifacts and sources to provide appropriate context and structure. Such capabilities are used to help analyze and track information lineage and system dependencies.

- **Master data management** define reference information to provide a common semantic understanding to ensure proper interpretation of data across various operational and analytical data and information stores and types.

- **Information life-cycle management** manage the state of information through varied stages of creation, maintenance, and retirement.

Other basic services tied to such an environment include auditing and logging of information processing activities and overall information and message movement capabilities to ensure persistence for a stateful environment.

OVERVIEW OF IBM'S APPROACH TO SOA AND INFORMATION AS A SERVICE

Through years of experience, IBM has developed a variety of services, technologies, and methodologies that focus on how organizations are positioned to extract value and raise competencies to address their unique information requirements. These competencies are oriented around IBM's Information On Demand Maturity Model, which includes concepts ranging from addressing information governance and change management to developing and maintaining a flexible information infrastructure.

Similarly, IBM approaches SOA initiatives and investments from both business and technology dimensions. SOA is an enabling architectural construct that combines a variety of technical capabilities, methods, and patterns. However, IBM also sees SOA as a business strategy and thus elevates the discussion to how SOA supports explicit business initiatives. The company has also developed a model that speaks to key goals that organizations may initially target as entry points for SOA, including people, process, information, reuse, and connectivity. An interesting point to this is that in reality, these goals are highly interlinked and often should be viewed in combination.

IBM offers a tremendous span of technologies that can support an SOA environment, from design and development tools to a vast amount of middleware and messaging technologies and an evolving set of service management capabilities. Beyond core database management offerings, IBM has now concentrated efforts in advancing capabilities specifically around the information-centric dimensions of SOA.

IBM Information Server

IBM Information Server is designed to be an infrastructure approach to coordinating and addressing data-oriented service and integration functions in a dedicated fashion. With this product, IBM has consolidated and unified its information integration technologies on a set of shared "services." It is positioned to help organizations consistently address and reduce the volume of physical and platform-centric database connections that need to be coded and to provide data functions such as profiling, transformation, cleansing, replication, and auditing in either scheduled or real-time, in-stream processing modes.

IBM Information Server provides connectivity to a vast amount of data or content sources and the ability to deliver information through a variety of mechanisms, including event-based processing capabilities. Centralizing these functions enables administrative tasks like security, user administration, logging, and reporting to be managed and controlled in a unified fashion. Abstracting and caching frequently requested data enable more of these requests to be satisfied without directly querying data sources, which can improve performance of processes and protect core information assets. All of these functions are based on a parallel processing infrastructure that provides leverage and automation across the platform, targeted to address high availability, reliability, and load balancing.

Underlying these functions is a common metadata foundation to track the meaning of the information, where it came from, and how it is related to information in other systems. The IBM Information Server repository capabilities are important to how this infrastructure relates to other elements of an SOA environment and will be a critical dimension that evolves over time.

Integration logic, as well as all the previously mentioned operations, built within the IBM Information Server can be deployed as a shared service within an SOA. The IBM WebSphere Information Services Director module is designed to allow developers to take data integration logic built using IBM Information Server and publish it as a service. It also supports arrays of structured data types so that multiple rows of data can be passed through a single service call. IBM Information Server supports a choice of open standard interfaces, and a service can support multiple protocol bindings, such as SOAP/HTTP (Web services for ubiquitous support) and Enterprise JavaBeans (EJBs) for direct Java support. Another module of the IBM Information Server is the WebSphere Business Glossary, which provides a simple mechanism to attach business definitions that can be tied back to physical data sources.

This product represents a culmination of technology that IBM has acquired and evolved over time. IBM Information Server combines the technologies within the IBM Information Integration Solutions portfolio (WebSphere® DataStage®, WebSphere QualityStage, WebSphere ProfileStage, and WebSphere Information Integrator) into a unified platform. IBM will continue adding to and leveraging the IBM Information Server capabilities as a platform and foundation for other offerings, such as master data management, entity analytics, and more.

IBM CASE STUDY

IDC interviewed a selection of current IBM customers to explore their views and experiences and to elicit their advice to prepare other enterprises as they embark on the path of adopting services-based computing and creating an information services capability.

A Large International Publisher and Distributor

The Situation

A leading publisher with over $2 billion in revenue and nearly 10,000 employees worldwide, has established a well-known, international brand, focusing on providing quality products in a variety of forms, including, among others, books, magazines, educational technology, teaching materials, television programming, film, videos, and Web sites.

Over the years, the company has experienced a consistent pattern of mergers and acquisitions along with its own organic business growth as it expanded with new opportunities and delivery channels. The company runs a very federated organization with many different product lines and varied business models.

Most of the company's systems had each evolved independently, and as the sharing of information between them needed to be addressed, the mechanism used had been primarily tightly bound file-sharing arrangements. Maintaining this type of environment as it was continuously evolving was challenging for the IT group, not only to navigate through the varied information types and forms but also, most importantly, to stay on top of all the semantic meanings behind the underlying systems. This overall situation became a major impediment to business change, especially as one enhancement could have a ripple effect across the IT landscape, involving timely and costly efforts.

According to the director of enterprise architecture and integration, the firm greatly needed to advance its operations to address the Internet channel at the turn of the decade. The company embraced the opportunity and designed its first ecommerce storefront based on Java, weaving together point-to-point connections and varied message structures. The company's IT environment had at that time largely been dependent on a mix of different generations of systems, particularly legacy systems that handled all the back-end fulfillment processing.

Within a week of the successful launch of the first site came a request to open another storefront. This effort would have required yet another set of new message types to be addressed that would need to be added to the existing environment along with changes to the recently implemented formats. At this point, seeing that this type of activity could exponentially get out of hand, the team decided to stop and reflect on the overall architecture for these systems and moved to create a more structured, standardized approach to address what would be a critical and expanding part of the business.

The Approach

At the time the company moved to adopt SOA, although the term and overall idea had not really entered into the limelight as they have today, the strategy it took applied service-oriented techniques. The company undertook this architecture as a set of principles and, building from an initial implementation, continued to extend the environment. The team never made this endeavor a project unto itself, rather, the endeavor always fit with the purpose and scope of a specific project.

Defining the initial framework was key. The target was to meet the needs of the project, but by defining all elements of the solution from a business-centric perspective subsequently made them reusable for the enterprise. The company worked with IBM in a very short time period, only two weeks, and developed a framework for common message services that would be used to represent the needed information and business events for all of its ecommerce efforts.

Key to this effort was the team's focus on the business perspective for all the elements of the solution; therefore, the overall design was to be completely independent and agnostic of any technology. By focusing on understanding the various business events, workflows, and information needs as they related to a customer, a product, a particular order, or any other aspect of how such transactions affected the business, the team would create a core foundation. This fed into what became the reference architecture to apply to all of the company's design and integration work. Core to the organization's SOA approach was to separate the integration middleware from the information services environment. With the decoupled aspects of the infrastructure as well as the application topology, any changes to underlying data models would not impact the systems or the integration and messaging constructs.

According to the company's director of information management, this subsequently drove the initiative to describe and define customer and product information at an enterprise level. The company now has in place standardized corporate product, customer, and order data models. This entailed bringing together separate processes and sources into centralized database structures and business rule sets.

The Solution

Due to the course that the team took to design its message services independent of any specific underlying infrastructure requirements or protocol, the company has been able to remain flexible as varied standards and technologies have evolved in the marketplace. Establishing a common and stable message scheme was key to enabling the amount of overall system stability and extensibility it has been able to enjoy and capitalize on. With each new request, the ability to use and reuse services due to this level of consistency has been paramount to achieving productivity gains and time to market.

With the first ecommerce storefront it created, the company utilized IBM's WebSphere MQ as its message transport mechanism; however, with the SOA design, it is not restricted to use only this product or any specific formats. That said, the team is also not constrained to utilize any specific versions of Web services protocols, but it has the dexterity to address any implementation requirements that a particular business and IT scenario necessitates.

To fuel its information integration efforts, the company is utilizing the cleansing and transformation modules of IBM Information Server to address standardization, recognize duplicates, and enhance the data with customized business rules. By creating an independent information services hub, the company can address many of the steps involved in ensuring that the quality and integrity of its information are shared throughout all of the consuming applications and services in real time. A key business requirement is the ability to service a base of customers that may have varied interactions with the firm; thus, the processing needs to be event-independent, but correlations and relations are extremely important in order to service its constituencies through their changing life cycles.

Within the first two and a half years of the implementation, the company estimates it has gleaned $800,000 in direct savings and has drastically reduced time to market with its efforts due to the amount of reuse and abstraction gained from this architecture. The team has been able to invest further in its middleware capabilities, allowing it to address multiple integration projects that, over the subsequent five year period, are estimated to account for multimillion dollars in aggregate project savings.

Lessons Learned and Looking Ahead

According to the director of enterprise architecture and integration for the company, one of the biggest challenges was getting employees to think differently and become technology agnostic. This required putting some real thought behind how to approach their needs at a level of abstraction. Employees have since learned the power behind that type of model and the flexibility it allows to tackle their needs a project at a time. The company rolled out two initial applications in 2001 and now has over 20 running in this environment.

The director can't stress enough the importance of maintaining a business-centric, technology-agnostic SOA approach. "Describing what needs to be communicated via services strictly in business terms and information [rather than specific data schema] changes the nature of the conversation with the business users and gets them to focus on what it is that they are really trying to accomplish." He goes on to note that ironically the initial skepticism of such an approach came largely from business sponsors as much if not more than the technical staff, but they soon found this to be an advantageous situation. "Any technical gaps encountered when integrating a new system are exactly that. Any argument between a systems implementation and the business-based descriptions are nullified — the business wins, and the gap is clearly how far a system is from truly implementing how the business functions."

This tack has enabled the company to more readily adapt to various technologies. For example, the firm has integrated Cobol systems using a fixed format version of an event with a system using Web services (SOAP/HTTP). The content is the same, the business information is the same — only the technology description differs. Keeping definitions concise and interfaces bounded to only what is needed to describe a specific event allows wider participation, although this may introduce the need to employ a broader array of descriptions.

The company looks forward to heavily leveraging and extending its SOA environment. It is now dealing with numerous projects, adding subscribers to business entities, integrating new packaged applications, putting into place a new purchasing system, and more. The IT team also expects to standardize all of its B2B transactions, putting into place a partner gateway that will leverage standardized protocols. Part of this project will involve routing and sharing internal order and status information with third parties.

To gain control of this ever-expanding environment, the company will be putting in place a more comprehensive governance model. This becomes much more critical because the SOA involves multiple stakeholders inside and outside the IT organization, especially the business. At first, many within the company did not entirely understand the emphasis and investments required to roll out SOA, let alone the technology requirements. Now, with the successful projects that have taken place and a keener understanding that is becoming more pervasive across the company due largely to strong communications between IT and the business, a greater transparency of information and business value tied to the company's SOA efforts exists.

CHALLENGES AND OPPORTUNITIES FOR IBM

Among the major issues that IBM and other vendors face in today's market are the still nascent levels of understanding about SOA and its unique attributes and information-centric requirements. The onus is on these providers to educate and transfer skills to their prospects and clients in order to fuel activity and mitigate perceived and actual risks in moving to this type of architecture.

One of the key values of SOA is the ability to flexibly leverage both new and existing resources at varying degrees. What organizations need to understand most often at the onset are where and how to apply these designs in a manner that will gain them the most success and business benefit. Although immediate return on investment (ROI) can be gleaned, the real value of SOA can be seen in more of the total cost of ownership (TCO) as these environments are enhanced and maintained over time.

With every new wave of infrastructure-oriented solutions also comes a mandate to prove reliability and scalability. Many former information integration solutions have often been deployed in dedicated silos and constrained to known circumstances. Continued streams of reference cases will be required to show that an abstracted and federated information services tier can provide the necessary robustness and dependability on a large enterprise scale in an SOA and event-based environment. That said, the ability to organize and manage all the complex underlying models, definitions, and relationships will demand close attention by organizations deploying such solutions.

IBM has assembled significant amounts of technology through both acquisition and native development. The IBM Information Server is positioned as a unified environment that now shares underlying metadata among its many functional modules. Especially as it has also added integrated registry and repository service capabilities into the mix, it will be critical for IBM to provide visibility and advanced

user interface capabilities to help users understand and better take advantage of this important, shared construct and differentiate it from earlier versions where each module was more of a discrete offering loosely linked together within its former integration suite.

Next steps also involve advancing the marketplace's understanding and use of ontology standards and capabilities and leveraging in-depth analyses, such as performing impact analyses to aid in the design and maintenance of the ever-building complex web of information sources and relationships. This will take time to evolve, especially considering the varied forms of content to address.

An additional need and opportunity will be for IBM to evolve its transformation and mapping capabilities to address known systems and sources beyond its existing inventory, making it that much simpler for a user to adopt. As large packaged application providers release newer solutions that house large repositories of services and varied reference data definitions, it will be critical for IBM to evolve and offer specialized capabilities to address any proprietary or unique situation. This overall technology approach should inherently help optimize the efforts its customers may find in future solution migrations, but the extra assurance that IBM's technology can help support them when the time comes and that such moves will neither disrupt nor conflict with their existing deployed environments is crucial.

CONCLUSIONS AND RECOMMENDATIONS

Gain Control of Information

Many organizations have realized the inevitable — that change happens — and rather than fight the tide, they are now embracing strategies to optimize how they both cope with and capitalize on volatility. Those that can more readily take advantage of events as they transpire can be more competitive, compliant, and accommodating to their respective constituencies. Across the globe, the ability to move swiftly and address changing market demands is paramount, and if one has constructed access and management of information in a physically bound manner, it will continue to be difficult to adapt as needed.

In the same vein, organizations have been inundated with data and content and the stream of information is flowing with no end in sight. Enterprises that put into place a mechanism to manage the flow and representation of information in a more consistent, unified, and automated fashion can also become much more efficient and responsive. In complex SOA environments that promote loose coupling of providers and consumers of information and services, an infrastructure layer that can mediate between these entities is needed to manage workflows and enforce business rules and system policies. This can help ensure proper handling of information such as transformations, workflows, cleansing routines, and more. In a more holistic approach, organizations should also look to create an information governance process that is synergistic within the overall SOA and IT governance programs.

Some key considerations in leveraging a services layer in an SOA environment include the following:

- **Abstract.** Keep processing complexity and volatility away from core information assets.
- **Automate.** Prepare for addressing information services within the context of a process and managing state for multistep and long-running transactions.
- **Assure.** Address quality, accuracy, and validity of information and information workflows.
- **Associate.** Model and design information within and across heterogeneous systems (which can also include master data and metadata management techniques).
- **Optimize.** Prepare for volume and exception handling, performance, and security protection.

While all these steps can be taken and automated in an evolutionary process, the hard work of determining the most appropriate information services and message constructs that map to business dimensions and requirements remains. Thus, a key driver behind adopting infrastructure to help facilitate the process of running and optimizing these environments is to allow valuable resources to focus on what matters most, to address areas of core and differentiating value to the business rather than on mere technological underpinnings.