

**WHITE PAPER**

**Business Forces Driving Adoption of Service Oriented Architecture**

Sponsored by: SAP AG

Sandra Rogers  
April 2005

**TABLE OF CONTENTS**

	P
<b>Business Imperatives Driving IT Initiatives</b>	<b>2</b>
The Importance of Architecture in Addressing Business Change.....	2
The Benefits of Service Oriented Architecture.....	2
<b>Building Momentum in Web Services and SOA</b>	<b>4</b>
Today's SOA Deployments.....	5
<b>SOA: An Enabling Framework</b>	<b>6</b>
An Evolution of Design and Standards.....	7
<b>SAP's Enterprise Services Architecture</b>	<b>8</b>
SAP Customer Experiences.....	10
Air France - International Air Transportation Service Provider.....	11
British American Tobacco - International Consumer Goods Company.....	13
Arla Foods - European Agricultural Firm.....	14
Telstra Corporation - International Telecommunications Provider.....	15
CEPSA Group - European Process Manufacturer.....	17
Asian Paints - International Process Manufacturer and Distributor.....	18
Israeli Ministry of Justice - Federal Government Agency.....	19
SAP Opportunities and Challenges.....	22
<b>Building on Experience: Steps to Capitalize on SOA</b>	<b>23</b>
The Goal: The Dynamic Enterprise.....	24

## **BUSINESS IMPERATIVES DRIVING IT INITIATIVES**

Today's enterprises are under a great deal of pressure to adjust rapidly to changing business dimensions and dynamics and, at the same time, do more with fewer resources. Although each enterprise faces specific pressures particular to its industry or ecosystem, some common trends impact all enterprises alike.

Competitive environments, economic constraints, customization requirements from partners and customers, and government regulatory initiatives continue to influence organizations to adopt new and enhanced business processes. These new business processes require information with greater intensities around timeliness, accountability, and quality. Information technology (IT) is a core element fueling mission-critical processes, providing a necessary foundation for automation and continual analyses.

---

### **The Importance of Architecture in Addressing Business Change**

For years, enterprises have been busily building up stores of applications and systems to address explicit business needs at a particular point in time — presenting a static solution. Many of these applications have been constructed incrementally over long periods of time based on evolving functional specifications and systems scenarios. The resulting situation is akin to taking a house and adding on wing upon wing, each with a separate foundation, utility infrastructure, and style.

Such fragmented application environments have resulted in increased costs to coordinate and run application systems over time, missing the mark for many organizations' demands around total cost of ownership (TCO) and return on investment (ROI). A model that promotes reusability of core infrastructure and application services is ideal for increasing value and maintaining high levels of control. Of additional importance is a system that is built for integration and change.

---

### **The Benefits of Service Oriented Architecture**

Enterprises that have implemented Web services are finding significant rewards centered on cross-platform integration. These benefits, however, only touch the surface of what can be truly achieved with a further abstracted environment utilizing a service oriented architecture (SOA). By constructing autonomous capabilities, enterprises can sever interdependencies between systems, applications, and services and target development efforts more effectively at business needs.

The following examples identify where organizations commonly seek to take advantage of the flexibility provided by SOA:

- ☒ **Value chain collaboration and optimization.** Extending and enhancing collaborative processes and information exchange with partners, suppliers, and customers is a pervasive theme behind many of today's Web services and SOA-based initiatives.
- ☒ **Regulatory and fiscal compliance.** The expanding number of government- and industry-mandated compliance requirements is levying additional process and information challenges on many organizations today, with more expected in the future.
- ☒ **Mergers and acquisitions (M&As).** In an M&A situation, organizations seek to leverage the best resources and assets from the combined entity as quickly and cleanly as possible, as well as provide a consolidated view of the entire landscape.
- ☒ **Decision support and consolidated views.** The ability to extract and analyze information from across varied systems and data stores in a timely manner is crucial to providing today's enterprise with more nimble and accurate decision making, reporting, and automating business processes based on real-time assessment of business state.

As experience and technical capabilities grow, so do the business scenarios that can take advantage of the SOA construct. Therefore, the benefits of SOA align to *where IT and business goals converge*. In a more generic view, the following list summarizes the key issues that can be addressed by SOA:

- ☒ **Cost savings and efficiency.** By leveraging and reusing existing assets and streamlining processes, an SOA not only can save direct development costs but also can have a tremendous impact on minimizing efforts for ongoing maintenance.
- ☒ **Innovation.** The ability to add or change smaller modules of work that will effectively interoperate within existing processes can allow organizations to focus work efforts toward core and differentiating values and help accelerate the introduction of new products and services.
- ☒ **Extension of the enterprise.** The ability to connect processes and information across and beyond organizational boundaries by leveraging standards-based services in an SOA can lead to multiple benefits: support for business relations and automation of cross-enterprise processes, flexible sourcing scenarios, and consistent dissemination across varied channels and devices.
- ☒ **Governance.** The abstracted capabilities to handle security, monitoring, and management utilized within an SOA can provide an ideal foundation to apply and administer rules and oversight effectively across the enterprise and all its business processes.

## BUILDING MOMENTUM IN WEB SERVICES AND SOA

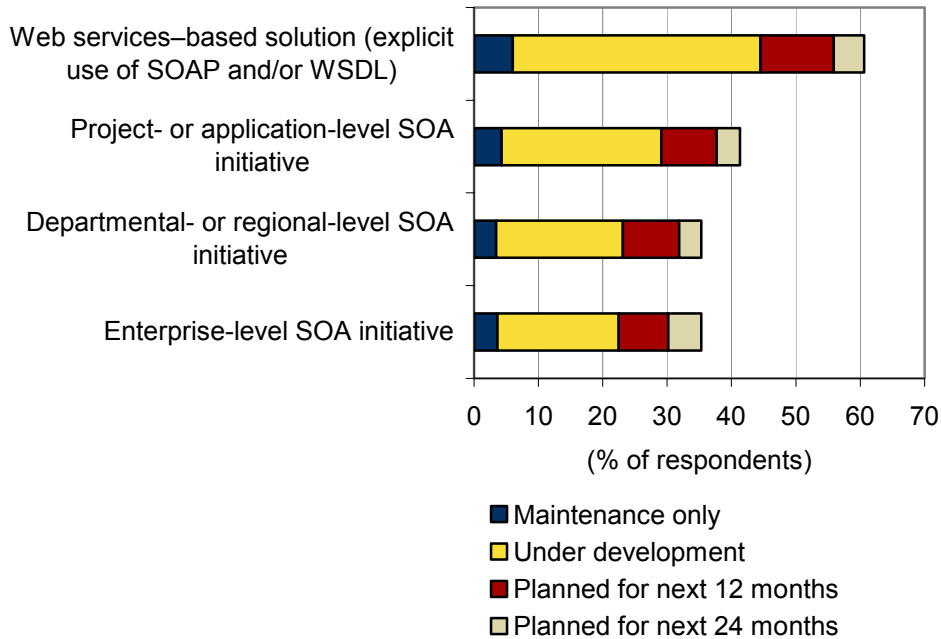
Over the past few years, the use of Web services has increased steadily, forming a "network effect." A growing percentage of large organizations have indicated a need to create an environment to handle the volume and complexity of managing these solutions, and these organizations have committed to an overall long-term IT strategy founded on SOA principles.

The pervasive adoption of Web services among the software and IT communities at large has served as a catalyst to open the doors for standards-based SOAs to move from theory to working prototypes to early production implementations. Although many organizations plan to ultimately extend enterprisewide SOAs, most use the architecture initially at the application or project level, while some are already rolling out departmental- or regional-level SOAs (see Figure 1).

**FIGURE 1**

### Status Time Line of Web Services and SOA Initiatives

Q. Which of the following IT initiatives does your organization have under way or planned?



n = 467

Note: Data is unweighted.

Source: IDC's *Software Development Study*, 2004

Organizations are also beginning to reap the benefits of establishing enterprisewide architectural teams and governance initiatives. The current anxiety circling fiscal and government compliance is prompting more enterprises to enforce better controls and centralized designs around important systems and business policy, which all correlate nicely with SOA philosophy. More effective communication and knowledge sharing are facilitated by these architectural teams, speeding deployments, coordinating reuse of design efforts, and also producing more rationalized software procurement practices.

Although many organizations have bought into the concept of SOA from the top echelons, eliciting cooperation at the tactical business level is another issue. IDC believes that although the goal is enticing, sometimes a corporate mandate to adhere to an overall architectural policy may be required. Organizations that have been able to approach SOA by balancing tactical short-term business goals while still building toward their more ambitious long-term strategic infrastructure goals already have begun to see significant leverage and savings. These enterprises expect to glean even more from these systems as they grow and mature.

Most organizations admit that it will be some time before they have updated their entire infrastructures to respond in full to the demand they are seeing to move to pervasive use of Web services and/or to an enterprise SOA. This moderate pace of adoption can be attributed in part to the sheer lack of available fiscal and human resources to dedicate to such a project. However, for most, it is a realistic assessment given the maturity level of critical standards and technologies, what capabilities are currently available, and how quickly an organization can expect to assimilate new computing environments. For many enterprises, it all boils down to risk: How great should the investment be for the returns expected, and in what time frame should enterprises expect to see returns? Most organizations see the process of building SOA as a multiyear evolution, starting today with harmonized business and infrastructure planning.

---

## **Today's SOA Deployments**

A variety of business solutions are viable targets for using Web services technology and an SOA-based design. A clear focus for many of today's deployments involves extending information and business processes to new users (e.g., employees, partners, suppliers, customers, and agencies). Other typical solutions include optimizing procurement, inventory, and B2B information exchange processes as well as sharing sales and financial information for use in planning, billing, and credit processing. A plethora of industry-specific use cases have surfaced. For example, solutions within the healthcare sector range from claims processing to bedside patient care. Significant interest exists in utilizing this technology to address specific compliance initiatives such as HIPAA and Sarbanes-Oxley and in extending a general foundation to address whatever future regulatory and corporate mandates might be required.

In general, SOA adoption is really about enabling and deploying a more integrated environment of next-generation, network-based solutions. But beyond application-specific drivers, many organizations are looking to optimize overall systems design as they consolidate multiple instances of Web, client/server, and legacy mainframe

solutions, addressing both cost and complexity concerns. The following real-world examples highlight how some organizations have only scratched the surface in realizing SOA benefits:

- ☒ A technology manufacturer significantly boosted sales revenue by building a standards-based platform for integration and compatibility across its various retail channel systems. By doing so it incorporated demand information into its early design phases and increased "configure-to-order" capabilities.
- ☒ Several financial institutions, having gone through multiple M&As, are consolidating their applications, databases, and systems. Often, a basic Web services-based integration approach is implemented prior to a more complex SOA rollout. A key driver is the desire to have one consolidated view of their clients to identify up-sell and cross-sell opportunities.
- ☒ A car rental agency can enable remote locations to customize rental agreement templates with a shared database, improving time to market for customizing partner product bundles.
- ☒ An airline increased efficiencies by providing self-service booking capabilities integrated into all required applications, both within and outside the boundaries of the enterprise.
- ☒ A leading North American bank added new functionality to existing Web-based customer application processes and created a dashboard with a consolidated view of customer account and credit information. This move allowed the bank to retire half of its process locations and save several million dollars in costs. Another bank now allows online customer access to banking services previously available only to call center agents.
- ☒ A U.S. federal agency created a shared service center to better manage inventories and handle logistical processes across its agency, customers, and commercial trading partners. By implementing a seamless data architecture, it can more efficiently handle requisition approvals and updates, inventory searches and allocations, shipments, and financial transactions.

## **SOA: AN ENABLING FRAMEWORK**

SOA is a systems and application design paradigm that leverages independent, self-describing modules of code or "services" that can be reused and composed into multiple processes and composite solutions. It is a foundation that is geared to support a dynamic business environment.

These services ideally will have standardized, published interfaces for ease of discovery, identification, and consumption. They can encapsulate independent data-, systems-, or business-centric functions, and they can be dynamically invoked automatically by other systems and services or upon request. The scope and complexity of each service, aka "granularity," can vary based on the best fit for its defined purpose.

SOA platforms require many of the same basic support functions as traditional distributed systems. In the case of SOA platforms, however, these functions are optimized as virtual services themselves and provide greater technical controls within a network-based construct. Therefore, SOA itself is not a technology, but it is *enabled* by critical IT capabilities. Many vendors address either parts of or more holistic platforms to support SOA. Ideally, these efforts should embrace standards, allowing an enterprise to create an integrated, unified platform — whether composed of best-of-breed technologies or an out-of-the-box preconfigured framework.

A few of the basic design principles associated with SOA include:

- ☒ **Decentralized, decoupled, modular design.** By leveraging virtualized capabilities, an enterprise can reduce the problems or risks associated with introducing new technologies and information sources into operational environments and increase the types of software and devices that may be utilized.
- ☒ **Autonomous services.** Each "service" should perform a cohesive and well-defined set of functions; be self-describing and discoverable; and be independent of platform, data, or process.
- ☒ **Dynamic service invocation.** The ability to route and trigger services in a dynamic fashion utilizing abstracted operational and business rules is a key technological foundation supporting flexible use of services.

Core IT capabilities to support SOA include integration, process orchestration, state management, policy, and deployment. Surrounding these capabilities are IT services that determine how solutions are built (development), accessed by people and other environments (access), secured and managed (security and management services), and utilized (application and data services). By creating levels of abstraction in the design model, enterprises can more easily and cleanly define and enforce centralized business, management, and security policies.

---

## **An Evolution of Design and Standards**

Many organizations have needed to strike compromises between a focus on tactical, time-sensitive business requirements and the desire to fulfill a longer-term IT strategy. An SOA by design should and will evolve, so the ability to incrementally build and deploy an evolving environment can be readily accommodated with SOAs. In understanding the need for SOA evolution, one must also acknowledge that the industry will be determining critical standards for use in SOAs for some time, moving up the stack from core interoperability through guaranteed messaging to varied levels of systems and business semantic definitions. These evolving standards will also be part of the SOA evolution.

The use of standards throughout the many layers of the computing landscape is critical to enable much-needed interoperability, maximize leverage for future development, and minimize configuration constraints. Coalitions and standards bodies are addressing not only technical issues but also much-needed business and industry semantic dimensions. Examples of key technology-oriented standards

include XML, SOAP, WSDL, WS-Security, WS-Reliable Messaging, WS-Policy, BPEL, and more. Some of the more well-known business and industry standards include RosettaNET, UCCnet, CIDX, and SWIFT, among countless niche industry variations based on XML.

Standards-based SOAs are extremely useful for organizations that are simply challenged by a highly heterogeneous IT environment. Another primary catalyst driving enterprises toward adopting SOA is the complementary and enabling nature that such an applications infrastructure brings to the worlds of grid and utility computing. The heart of these concepts is the ability to flexibly leverage computing resources.

## **SAP'S ENTERPRISE SERVICES ARCHITECTURE**

SAP AG has embraced SOA with what it terms Enterprise Services Architecture (ESA). The company presents ESA's "Design for Change" as the conceptual foundation for all its applications, such as mySAP Business Suite, SAP's Industry Solutions, and SAP xApps. The overall ESA construct is intended to include both SAP and non-SAP technologies along with pervasive IT practices such as application life-cycle and systems management.

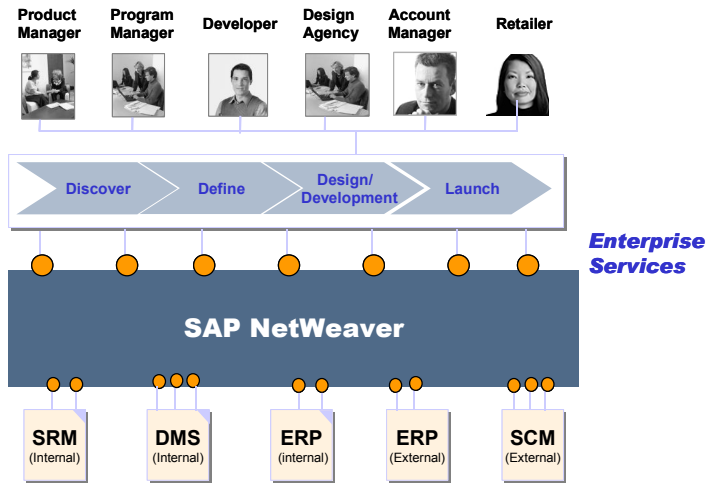
SAP's "enterprise services" are building blocks of specific business scenarios that comprise what can be multiple processes and services, forming a composite solution. A few examples where such composites support specific scenarios are Supplier Collaboration, Outsourced Manufacturing, and RFID Vendor Managed Inventory. Here, Web services play a role in exposing specific functionality that can be incorporated within the greater business context. SAP refers to its enterprise services as providing the "common business vocabulary." Some may argue that these services are just the instantiation of "larger-grained" versus "finer-grained" service modules. Either way, the overall business process provides the needed semantics of how the lower-level services are utilized.

For a common example of how Web services would work in a broader enterprise context, consider the task of canceling an order, which could touch several "subtasks": sending a confirmation to the customer, removing the order from the production plan, flagging corresponding material, notifying the invoicing department, and changing the order status to "inactive." Each subtask can be a "Web service"; however, subtasks can also be linked together to form a cohesive enterprise service.

Figure 2 presents a high-level view of a potential process based on SAP's ESA.

**FIGURE 2**

**Example of an Enterprise Process Leveraging SAP's Enterprise Services Architecture**



Source: IDC and SAP, 2005

SAP's NetWeaver platform, which has evolved from discrete products, comprises many of the key application infrastructure capabilities and services designed to support ESA as a unified platform. It includes integration and deployment facilities and provides a foundation to support higher-order capabilities related to business process management, analytics, and collaborative processes. SAP's Composite Application Framework refers to the definitional capabilities that the vendor is building to support composite solutions. In this environment, both SAP and non-SAP applications can provide the business functional solutions incorporated into an SOA framework. The company's product line is at varied stages of maturity and functional support of standards-based SOA, progressing along a road map outlined through 2007.

SAP's overall ESA road map outlines the following stages of product development designed to gradually address its customers' business needs:

- ☒ Last year, SAP worked to identify and prioritize what it believes to be the most important use scenarios to target for the development of enterprise services. SAP will identify more discrete services on a set of business indicators — for example, collaboration (e.g., B2B, B2C, and B2E).
- ☒ During 2005, SAP will provide customers with an enterprise services inventory containing current and planned scenarios associated with corresponding services. This inventory will aid customers in planning and determining what capabilities SAP will need to leverage. The company will also work to introduce flexible access and acquisition methods for services, such as shared and outsourced models.

- ☒ The repository with physical services will be available by 2006, and all of SAP's solutions will be "enterprise service"-enabled by 2007. The company anticipates that its vast network of partners also will offer extended capabilities and targeted industry solutions.

It is important to note that, in preparing to deliver on the ESA road map, SAP claims that all of its mySAP Business Suite applications are currently Web services-enabled. Service interfaces include all those that have historically been accessed via SAP BAPIs and also address RFC modules, IDocs, Java Classes, and Enterprise JavaBeans components. SAP continues to build support for Web services and related industry standards and already supports WSDL 1.1, UDDI 2.0, SOAP 1.2, WS-I BP 1.0, WS-Security, BPEL, XMLA, RosettaNET, and XBRL within its offerings today.

---

## **SAP Customer Experiences**

IDC interviewed a selection of current SAP customers to explore their views and experiences in adopting services-based computing and to elicit their advice to prepare other enterprises as they embark on this path. What we discovered was a consistent enthusiasm among these organizations for SOA; it is the de facto long-term IT architecture for which they will strive. Another pervasive belief was that reusability is the primary initial value of SOA in the eyes of IT executives. IDC also discovered that these customers believe that SAP's ESA road map outlines key elements that directly map to what they want to accomplish with SOA.

Based on this research, IDC believes the success of these organizations in achieving important milestones on this SOA journey is influenced by a cadre of issues, such as:

- ☒ Identifying ideal use cases (or business processes)
- ☒ Building experience and best practices in service design
- ☒ Influencing enterprise acceptance and practices
- ☒ Implementing integral, foundational technologies
- ☒ Monitoring solutions and effectiveness of services
- ☒ Balancing strategic (long-term) with tactical (short-term) business and IT goals, especially given the existing base of systems

The diversity of use cases for Web services and SOA implementations is an interesting phenomenon. At the onset, some organizations have targeted automating specific business functions and processes that were previously manual activities due to complexities in integrating fractured applications and systems. Others have opted to explore high-value, non-mission-critical business functions as proof points to expand the SOA vision, thus mitigating initial risk and ensuring future investments. Still others have concentrated on first enhancing their infrastructures to serve as robust foundations for scalable SOA environments.

The ability to easily add and extract specific applications and functions is another key driver in adopting SOA. Many of these organizations would rather focus on dedicating resources to their core business and capabilities and thus are looking to buy application solutions first rather than build their own. Many do not envision complete system overhauls but rather continued incremental change and augmentation to their existing computing environments.

### ***Air France - International Air Transportation Service Provider***

Air France is a leading European-based airline, servicing a global network of 184 destinations in 85 countries. The company has pursued a growth strategy even in the face of persistent competitive forces and an intense regulatory climate. Some of this organization's most critical business goals center on the customer experience and providing the best, easiest, and most efficient services. The airline is balancing many IT and business improvement projects; current business initiatives include leveraging new self-service kiosk and Internet technologies, optimizing processes especially around baggage or plane turnaround, and reaching out across greater channels to drive business. But one of the most pressing issues influencing the company's IT strategy and investments today, and for the next few years, is the assimilation of its recent acquisition of KLM.

Although the organization had already been building a services-based foundation, the ability to extend a centralized set of core resources and integrate varied systems across the merged entities is driving the IT team to focus even more on its Web services and SOA capabilities. SOA is a critical part of the firm's IT strategy; however, representatives from the company admit there can be important trade-offs between costs and timeliness to create services for specific projects. For the most part, all its IT initiatives need to comply with the service orientation, and it is the architecture team's role to ensure that compliance is enforced. The company believes that it is in the best financial interest of the entire enterprise to follow this SOA path rather than look at only the short-term ROI for particular tactical projects. IT views SOA as an architectural concept that is critical to follow, allowing the organization to best leverage existing applications and also providing a strategic foundation to promote reusability and enforce consistency.

Air France has been developing solutions for years by utilizing the construct of a layered architecture and building out business components to be leveraged within and as services. Nearly eight years ago, at the time the company was addressing another acquisition, the vice president of IT strategy did not want to make an internal sourcing decision based on the specifics of where existing applications were located. Therefore, the team embarked on building a service bus of its own to enable the development and implementation of an application service independent of its location (three main datacenters scattered in France) and its technical environment (Unisys and IBM mainframes, Sun or Microsoft servers) on which it was running.

Thierry Guez, Air France's manager of architecture, estimates that over 1,200 services are already in use, many within mission-critical systems. Although most of these services have been based on proprietary and custom-built technology, the company is now embracing Web services standards for specific purposes. Due to

intense security and privacy requirements, however, Air France has remained extremely cautious about the extent of its Web services usage to date.

The firm's IT department is purely centralized, putting the team at a great advantage in managing enterprise-scale SOA efforts. The architecture team's key responsibility is to align business requirements with IT infrastructure. The company embarks on annual reviews regarding how different technology can enable critical business initiatives, assessing both the fit and maturity of technology to satisfy their needs and, importantly, whether the business has truly clarified its requirements.

Guez estimates the majority of the company's existing services could be classified as "data access services," with, at most, 20–25% as encapsulations of business functions. According to Guez, building out real business services can be a challenging endeavor at times. To do it right, he believes that a company needs to take a 360-degree view of the service and model all different usage possibilities to ensure that it is generic and reusable. When designing services within the context of a specific solution, most organizations do not normally allow the necessary time for this critical step during typical development projects; therefore, they generate services that may be applicable only for a limited set of use cases. Those services that are more intensely analyzed will ultimately result in higher reusability ratios.

Air France has experienced a major benefit by doing such assessments while creating business services. This approach has resulted in more streamlined processes and solutions with more of a "real time" connotation. Such outcomes directly impact the business users because systems are more responsive and flexible. It also reduces business risk with more consistency of standard services available to different consuming processes. Next steps will be to delve further into the company's use of the SOA framework, expanding services related to customer information, flight schedule information, and baggage tracking.

Guez expects that the full integration of Air France and KLM systems will most likely take five to seven years. When assessing which solutions from the two entities will be leveraged and extended, the airline evaluates the service orientation of each candidate application as one of the key points to reduce the transition costs.

As for the most important issue to tackle when working with a standards-based SOA and Web services, in this lead architect's point of view, it is all about security. The company has been producing services from a mix of legacy systems for some time, and opening up these systems needs to be foolproof.

The company has learned a lot from its experience in building out its own service bus and expects to ultimately transition to a vendor-based product when the time is right. However, its first priority is standardizing KLM and Air France on a common messaging and integration platform to leverage and extend the foundation of services it has already developed.

Guez's advice to all those contemplating or already engaging in SOA is to always keep in mind that it is a long-term commitment. SAP is a critical part of this enterprise's systems environment, and in the future, Air France will look to SAP to provide what is

best to support SOA for its internal environment, assured that SAP will follow industry-protocols and proceed with support of its ESA road map.

### ***British American Tobacco - International Consumer Goods Company***

British American Tobacco (BAT), the second largest stock market-listed tobacco group in the world, does business in 180 countries and employs over 86,000 people worldwide. Its systems are indeed complex and must scale to support all of its operating companies' activities, including 87 factories in 66 countries. Over the past half decade or more, the company has dramatically transformed IT to be front and center in its overall business strategy. It operates under a tri-region shared services model, emphasizing global strategies and an integration solution model.

In early 2002, BAT had already begun to establish a long-term SOA architectural vision. The timing of this initiative coincided with a complete organizational technology strategy review, which had the goal of establishing a pervasive IT foundation to support global market expansion and future initiatives to optimize supply chain, materials management, and new product introduction processes.

The company had already gained some working experience with traditional EAI solutions and component technologies such as CORBA and COM. The IT team had also become conversant with XML and earlier Web services concepts. Senior IT management had envisioned moving to SOA for some time, and its decision to proceed was reinforced when enough of the leading software vendors committed their technology road maps to supporting the SOA model. Since then, the IT team has been putting in place the foundation of a global infrastructure, evolving from a highly fragmented environment with multiple ERP instances to a more consolidated application footprint leveraging federated IT capabilities. At the same time, the company has been building up shared resources to greater capacity.

Kevin Poulter, application technology manager, is responsible for defining global application infrastructure strategy for BAT. Providing insight into the company's adoption of Web services and SOA-based technology, he assigns the company high scores in its commitment and understanding of services-oriented technology and estimates a fairly conservative level of implementations thus far on this evolving technology paradigm. This is a realistic assessment for many of enterprises that are on the leading edge of the SOA adoption curve.

The company is very progressive in having adopted centralized architecture, organized technology councils, and created communities of practice. It has honed and continues to hone its IT governance around Web services. BAT is in the process of defining a review and approval process for its Web services, ensuring that each satisfies conditions and standards before being entered into the enterprise registry and ultimately accessed through an enterprise services portal.

As for specific technologies, BAT continues to use and implement a mixture of traditional integration and middleware solutions along with some best-of-breed Web services solutions for development, security, management, and business process orchestration. The company is investigating SAP NetWeaver (XI) and its business process management capabilities for future deployments. According to Poulter, the most critical of the SOA framework elements the company has put in place thus far

has been the technology to handle key management of Web services policies captured in a registry. This provides the company with the ability to manage service life cycles and the overall runtime environment by interacting with a service broker and monitoring routing as needed.

The most prominent SOA proof-of-concept project for BAT has been a supply-chain dashboard that combines information from SAP and other applications, such as i2, into a consolidated view. It was completed in only 10–12 weeks and at 70% less cost (versus an estimated 9-month project pursued purely from a data warehousing style implementation). This served as a watershed in highlighting the capabilities of the SOA environment to the entire organization. Poulter attributes the speed of deployment to the explicit use of Web services and JCA-centric adapters.

Having had the foresight to build an SOA foundation, the company is very excited about the business possibilities moving forward. It looks to continued new development within this environment, especially for B2B interaction purposes. The IT group also looks to streamline interactions across its ERP and other back-office systems, including developing (or as Poulter states, "arranging") composite applications as SAP continues to introduce new capabilities and service-enable its core application suite at much more granular levels. BAT sees the true value of SAP is in its business domain expertise and sees the vendor as a large contributor to its future SOA strategy.

And what about BAT's wish list for future SOA capabilities? The company would like to see SAP continue making technology easier to use, standards-compliant, and cross-vendor compatible.

### ***Arla Foods - European Agricultural Firm***

Arla Foods is a Scandinavian-based firm focused on providing dairy products to a global audience. It has historically grown from a number of mergers, takeovers, and joint ventures, with its most recent and largest merger taking place between Arla of Sweden and MD Foods of Denmark in 2000. All of this activity has led to an amalgamation of very disparate, fragmented systems and, more importantly, very diverse and division-centric business models and processes. The firm must continually advance its business opportunities to meet its aggressive annual growth target of 10%; thus, a nimble environment must now be generated across its eight divisions.

For the past few years, the company has been working to create and follow a harmonized IT road map. Some of the basics of this strategy include leveraging common structures for system definitions and control mechanisms. But at the root of it all is its unique attempt to holistically transform all of its business processes from the top down and from end to end. It is a significant undertaking: The company is creating an organizational and system-independent IT platform while reinventing its business to the benefit of the dairy suppliers it represents.

Claus Qvistgaard, IT services director, is helping lead the organizations on this very lofty challenge to create a unified and flexible technology foundation. The basic premise behind the new design is SOA, utilizing business services as autonomous system elements and allowing tremendous flexibility, transparency, and efficiency with a single point of maintenance and control. An extremely important part of the

entire initiative is the company's "global master data" project. Qvistgaard believes this project is a critical foundational element for the success of the entire undertaking, but he also admits that it is hard for any organization to implement.

Among the biggest challenges facing Arla and its IT team is how to effect and handle change. One of the most effective ways to deal with this vast amount of business reengineering is extensive communication. The company has created centralized architecture and standards committees and has also organized into three overall process groups with dedicated managers — one handles sales and purchasing; one handles supply chain; and one is dedicated to support processes such as finance, human resources, marketing, and operations.

Now that all the business requirements and processes have been mapped out and documented, the company is in the throes of implementing the details of this vision. Each process is being designed as a "template," and the goal is that all processes will be developed and implemented in phases by the end of 2005. With multiple projects already running in parallel and some impacting and integrating others, Arla is seeing benefits even from the nascent beginnings of its SOA, such as simplifying and automating once manual or contrasting functions.

The company is initially developing its solutions based on its heterogeneous mix of existing technologies, but it expects to eventually roll out a new centralized integration foundation and expand its capabilities with Web services. The company will move onto technology only after it has been proven reliable and scalable. Controlling risk and ensuring stability are important factors in what will be the end solution.

Because of the criticality of SAP applications to the overall environment of over 6,000 R/3 users, the infrastructure must support, optimize, and extend these system assets. It can't afford to roll out SAP to every part of the extended enterprise; therefore, it must utilize its capabilities and build out processes to interface with core functions. Thus, the company has embarked on a partnership with SAP and will be continually assessing the capabilities and its own readiness to take on the expanding offerings of NetWeaver and SAP xApps. IBM is another critical partner in its services and operations strategy.

As for advice to organizations tackling such an endeavor, Qvistgaard can't stress enough how full support from across the entire enterprise is critical, especially from top management. Making this project a top priority and dedicating substantial resources have been essential factors in its continuing success. As for technological improvements, he would like to see more offered by vendors on the life-cycle and management facets of the equation in the form of better support for versioning, management controls, monitoring, and stable performance.

### ***Telstra Corporation - International Telecommunications Provider***

Telstra Corporation is an Australian-based, leading global provider of telecom and information services with total sales of \$A20.7 billion. It serves a large and diverse customer base of more than 10 million households and businesses spanning multiple geographies. The ability to introduce products and services to market quickly and efficiently is critical for Telstra to operate in the deregulated and highly competitive Australian telecom market.

The company's IT environment is complex, with more than 1,500 applications that operate on multiple generations of technology. For more than four years, the company has sought to minimize costs of internal operations and reduce overheads and still provide innovative services and optimizing processes. Other major business initiatives have involved addressing merger and acquisition activities and government compliance mandates as well as managing externalized resource arrangements.

Telstra has chosen to adopt a services-based IT philosophy to glean as much reuse as possible from its information systems. The firm has used object-oriented technology and design concepts for years; however, it considers its SOA capabilities as fairly new, emerging from the proof-of-concept stage.

Applications with a services orientation include procurement and work management — two internal areas that can heavily influence costs and where savings can be achieved. Other information the company continues to expose as services, to internal systems, includes corporate employee and financial data, primarily for new development or enhancement initiatives that help automate previously manual processes. The company is additionally using Web services to integrate SAP applications and enterprise portal with an IBM business intelligence system, also creating reusable services for use in an SOA environment. The company is expecting to use the integration broker capabilities of SAP NetWeaver (XI) product to integrate SAP instances while maintaining its TIBCO message broker for B2B and other transactions. Next on the plate for development may be the automation of order process flows with additional self-service capabilities.

Anthony Bradstreet, lead architect ERP for Telstra, indicates that the ability to extend modules of truly reusable code to the enterprise can be tricky. Beyond issues of privacy, there are basic design challenges of balancing complexity of function to the right granularity of service. Bradstreet notes that the philosophy is similar to that of object-oriented coding; however, the added benefit of utilizing Web services standards gives a much more optimistic view that a high level of reuse can ultimately be achieved.

So far, the company has seen some dramatic results from its efforts. Bradstreet estimates that the new SOA and services have already more than paid for themselves, enabling the company to shut down systems and achieve savings of more than \$A1.8 million in software, hardware, and maintenance costs.

Ironically, while some of Telstra's initiatives involve getting at a single source of truth in its own IT systems, Bradstreet recognizes the challenges of dealing with various vendors' versions of standards and XML and understands it is an evolving process. As the market matures, some of these issues have already begun to work themselves out. Telstra envisions continued success marching down the SOA path, adding capabilities by leveraging packaged composite applications, such as SAP xApps, in combination with many of its own services.

### ***CEPSA Group - European Process Manufacturer***

The CEPSA Group is a global player in the petrochemical industry with a multiservice, multiproduct focus. With over 10,000 professionals, it operates internationally in four primary areas: fuels, production, petrochemicals, and specialties. This firm plays in a very dynamic industry and maintains a solid financial structure, modern industrial plants, and efficient supply chain and marketing networks. The business demands a 24 x 7 operational capacity and a tight cost-control structure. To compete, the company must support critical SLAs and warranties to partners and customers that demand access to information at any time and in any place.

Joaquin Reyes, director of information systems, defines strategies for shared services across the vast group of companies that make up CEPSA. A large portion of the IT group is physically centralized and charged with the important task of providing an integrated infrastructure to support optimized business processes and quality services, adhering to ISO, CMMI, and ITIL principles. To support such efforts, the company has committed to building a technological foundation based on open SOA and business component framework.

In a typical project scenario, funding is provided by internal IT, while a business leader sponsors each project and is involved from design through production. One such example is the project to migrate back-office order-processing functionality to the Web. With this effort, the company has already seen significant savings and has speeded its services, having eliminated manual data entry and validation of forms by automating the end-to-end process from metering to billing. What could have taken up to a month now can take place in near real time. And according to Reyes, this kind of automation is expected; there is no turning back.

SAP is a critical supplier of both transactional systems and infrastructure services to CEPSA, with multiple instances of R/3 retail and oil and gas applications running core parts of its business and a growing portal presence across the enterprise. The company has a significant and growing portion of its Web-based systems supported by J2EE and Microsoft .NET technology and also maintains a diverse EDI environment. Thus, with such a heterogeneous environment, Java, XML, and Web services are all playing increasingly critical roles in optimizing integration and offering robust real-time processes for internal, and eventually external, use.

Like any organization, CEPSA must balance its IT development efforts based on critical business need and its technology investments must map to what will provide the most value — in that order. The company is assessing NetWeaver's capabilities to address interface design and support; meanwhile, it is building out a separate messaging backbone that will eventually support centralized monitoring and managing of process workflows. At the same time, it is expanding its store of components to interface with SAP transactions and, in the process, learning design best practices to make these services as useful and reusable as possible.

Reyes admits that SOA is an overall goal and much is still to be worked out by the industry at large. To date, the company, like the IT community at large, is just building up experience with designing scalable solutions with this type of architecture and much still must be addressed with regard to Web services security and performance. Therefore, the firm has yet to publish external services. Realistically, Reyes estimates

that only about 1% of processes are currently utilizing Web services, but in a year's time, he expects to have the bulk of order and logistics processes interfacing with Web services. Purchasing and procurement are the target business process sweet spots of interest not only for CEPSC but also for many other companies.

The IT group must continually assess what transactions are clearly best suited for Web services, and it is working to determine its overall meta-directory strategy to manage collaboration and service reuse. The company is focused first on designing optimal processes within SRM and extending its use of its portal, laying down a foundation of business services. Looking forward, SAP factors large in this enterprise's SOA plans to leverage SAP xApps and more integration functionality within SAP NetWeaver as these technologies mature. The company looks to SAP to provide more guidance and educational services to its customers as they tackle the complexities associated with transforming their overall IT environments to this architecture.

### ***Asian Paints - International Process Manufacturer and Distributor***

Asian Paints is the largest manufacturer and seller of consumer and industrial paints in India. With operations in 23 countries, the company serves over 30,000 customers in Asia/Pacific, the Middle East, the Caribbean, and Africa. Over the years, Asian Paints has made significant investments in IT operations by automating important business processes, including manufacturing, distribution, and inventory management.

Manish Choksi, vice president of strategic planning and IT at Asian Paints, overlooks the entire centralized IT operation, which includes 45 employees responsible for all aspects of IT strategy and delivery. According to Choksi, Asian Paints views technology in general and SOA in particular as potential competitive differentiators: "The competition out here is so fierce that a few years can change the entire course of the company."

According to Choksi, Asian Paints set out in 2000 to "completely revamp IT," including a comprehensive migration of critical systems from in-house-developed custom applications to mySAP Business Suite. This migration, which is scheduled to be completed in the 2005–2006 time frame, primarily involves components of SAP CRM (including call center, sales, and some marketing capabilities) as well as SAP NetWeaver capabilities for integration and management (Web App Server, SAP Solution Manager, Portal). Asian Paints went forward with the migration project with the following goals in mind:

- ☒ Improving the functionality of core business applications via more robust and modern packaged applications supporting unique requirements for each customer segment (consumer, industrial, exports)
- ☒ Improving customer reach while simultaneously lowering costs by leveraging interaction between new SAP CRM and existing supply-chain applications
- ☒ Lowering IT infrastructure costs by consolidating functionality in a single system landscape

With longer-term strategic goals in mind, Asian Paints views the migration process as an important first step toward adopting SOA alongside SAP technology that will provide additional benefits in the longer term.

Asian Paints expects benefits of adopting an Enterprise Services Architecture, SAP's blueprint for an SOA, to include:

- Ease of integration of internal systems, including ERP and CRM, with the supply chain, R&D systems, and portals to support development of new applications
- Ease of integration of internal systems with supply-chain business partners — an important requirement for optimizing these relationships

Asian Paints currently exchanges information with suppliers via XML; however, there is no standard in its industry for information exchange, making transformations required on both ends. With SOA, Asian Paints envisions a system where partners can pull product and inventory information themselves rather than require Asian Paints to push this information. By taking an approach based on Web Services and SOA standards, the company expects interactions and new processes will lower development costs and improve the capabilities of information interactions.

The path toward ESA includes completion of the SAP migration process and implementation of SAP NetWeaver's integration broker. In addition to the integration broker, Master Data Management and possibly Business Process Management capabilities of SAP's NetWeaver are under consideration.

Although Asian Paints is not currently deploying applications using an SOA approach, it is working with SAP to understand what can be done in the next 18 months for internal systems, and it is planning to build SOA-based applications for business partner interactions (e.g., stock supplying and customer ordering) over the next three to four years. Specifically, these applications will target better and more integrated supply-chain and production planning processes. Asian Paints also plans to add business process management, automated controls for compliance, and specialized applications to support its painting services business with the new SOA architecture.

To succeed with SOA, Asian Paints will need to encourage business partners to follow the SOA path as well. Without the participation of such partners, the SOA architecture will derive value only from internal applications. Choksi notes that most of the company's current partners do not use SOA/Web services standards and may not have firm plans to move in that direction.

### ***Israeli Ministry of Justice - Federal Government Agency***

The Israeli Ministry of Justice is a government-wide agency that comprises 37 different units, each with tremendous workloads and pressures to fulfill the legal mandates of the country. It is critical for the ministry's overall enterprise to be agile and well-integrated because laws change and new coverage for its citizenship must be addressed and its systems must adjust rapidly to meet explicit requirements and time lines. Organizational demands that the ministry's IT units "do more with less" persist, but like most entities, the ministry has threadbare resources and its ability to squeeze out even more efficiencies requires a new development and architectural

approach to IT. Therefore, the ministry has undertaken a large initiative to adopt and prioritize funding for an agency-wide SOA.

Ronnen Brunner, the CIO for the Israeli Ministry of Justice, likens how the need to combine its various units and systems built up through the years to that of a company buying another company and needing to reconcile the dispersed assets to a shared platform. Many system elements tend to cut across multiple data sources, applications, and agency units, tackling sensitive issues such as land registrations, money laundering alerts, bankruptcy notifications, and more. Brunner's organization is in the midst of modernizing its 140 systems, many built a decade or more ago, to a common infrastructure and on updated technology. At the same time, it is automating once manual processes or implementing new pervasive capabilities such as digital signatures. Additional external obligations, such as Israel's membership in the global World Intellectual Property Organization (WIPO), place time- and context-sensitive demands on the IT team. Managing all of this is not a simple task for most organizations, and the unique attributes of the IT planning and procurement processes for a government agency add other layers of complexity to the mix.

The ministry leverages its close partnerships with its leading technology suppliers, Microsoft and SAP, to help assess and ensure that the many tiers of technology introduced into its systems environment will be compatible and architecturally sound. Brunner is also expanding his team of architects and believes that this task is best addressed with internal resources. The architects not only will amass comprehensive knowledge regarding all the underpinnings of the system over the long term, but they also will play a critical role in aligning IT initiatives directly to the agency's business requirements.

Beyond the first step of consolidating and centralizing its underlying hardware, the next most important task is to standardize on a common vocabulary for information across the ministry. A large part of the ministry's solutions depends on the processing, distribution, and archiving of documents; thus, a core element of its systems environment that continues to evolve is its enterprise content management (ECM) solution called Smart Enterprise. Addressing all "pillars" of a full life-cycle information management, this system supports multiple applications by acting as a system "service." Another critical layer being built is a core data service utilizing a warehouse, which will be designed to support all reporting and business intelligence activities.

An essential component of the SOA is an agency-wide portal based on SAP NetWeaver that will be utilized as the primary desktop interface and integration layer to all its application services. Although currently focused on supporting more than 3,000 internal users, this infrastructure will eventually be leveraged to integrate with a government-wide portal and offer external services to the communities the ministries serve. It is important that the portal be robust and rely on standards so that it can interface and integrate with the many services it will ultimately expose.

Brunner does stress that along with all the vast benefits associated with reusing system assets in an SOA, a policy and behavioral shift must occur regarding "ownership" of services. The ministry typically outsources most of its development work to external services firms and must reinforce that these teams not only develop

solutions as services but also leverage existing services. The complexities in dealing with contracts regarding who is ultimately responsible for the outcome of an individual service versus that of a solution that might incorporate that service are tricky. Brunner believes that even for organizations that use their own in-house development teams there exists a predisposition for each developer to use his or her own code, inherently wanting to guarantee that it functions to specification. And then, when considering the life cycle of the service and needed maintenance, the question arises regarding how and who "owns" the responsibility to ensure that anything else that calls a service functions as expected when it is modified.

To ensure that its service providers have the needed skills to apply to services-based solutions, the ministry has also instituted a more rigorous design and code review practice much earlier in the assessment and development process. To date, Brunner has found that many of the systems integrators in his country, even within the large global providers, lack the necessary expertise in SOA development, thus propelling the ministry to place an increased importance on obtaining detailed designs during the proposal stages of a project. He goes on to state that at a lower level, employing best practices from object-oriented programming designed for abstraction is important. Brunner estimates that even if only 15–20% of services are ultimately reused across the different ministries, the financial impact would be huge, with millions saved as well as shortened time frames for delivering services to the market.

The organization has selected the .NET platform for the development and integration of its services. Along with basic Web services standards, SOAP and WSDL, WSRP for portal is extremely important to the ministry to support industry-specific standards such as LegalXML and 5015.2 for records management. Plans also include eventually establishing a UDDI registry for services. Brunner states that beyond the deployment and interface tiers of the ministry's SOA, one of the most critical aspects of the overall platform is a good integration solution to provide support beyond the typical EAI and workflow capabilities. This is where SAP NetWeaver comes into the picture, enriching the different layers with a solution that binds them all.

Although the ministry's ideal solution has not yet been completely scoped, it should involve business process management and composite application development in an environment that can associate business processes all the way down to their data elements and to support Web services orchestration. Ideally such a solution would not only support the technical ranks but also allow more business users to participate in the design process. The ministry also has yet to implement a dedicated management environment or a true abstracted data layer to its SOA, but it plans to initiate RFPs in the very near future. One of the first areas it plans to attack will be a life-cycle management solution. Currently, most of these IT activities are handled manually for Web services, and as the volume and complexity of its SOA environment grow, so will its priority to invest in these technologies.

---

## **SAP Opportunities and Challenges**

SAP openly recognizes that fulfilling its ESA blueprint and SOA-enabling product line is a multiyear endeavor. Feedback from the customer interviews reveals some areas that demand attention; however, IDC has discovered that SAP is well on the road to addressing most, if not all, of these issues. The work will primarily involve building in increased capabilities, educating the market, and surfacing reference cases to gain experience and credibility for scaled implementations.

All of the reference SAP customers that IDC interviewed were very positive about SAP's overall vision of ESA; however, at this time, most customers interviewed also envision initially utilizing these technologies solely within the domain of SAP applications despite SAP's growing support for non-SAP environments. Extending capabilities, beyond SAP's own current application server to adhere to standard Java deployment environments and beyond SAP's own data management foundation to Oracle, DB2, and other data technologies, will be crucial in advancing the use and value of SAP's application infrastructure services. Around the time of these interviews, in fall 2004, SAP announced deepened support for J2EE and data standards to be incorporated in 2005 releases. IDC recommends that intense interoperability and functional testing occur as organizations seek evidence to support a decision to move more applications infrastructure to the SAP NetWeaver environment.

Building up stores of and readily identifying discrete Web services available within an organization's own existing custom-developed and packaged applications are extremely critical at this stage of SOA evolution. According to recent IDC research, the number 1 issue impeding software reuse is in the lack of awareness of software and services available for reuse. SAP has Web service-enabled modules of its application suite and is working in a broader sense to define and incorporate them into its enterprise services by 2007. Until then, SAP's ability to aid customers in identifying available services and interfaces will help accelerate momentum toward its ESA vision. Given that granularity of functional code use can vary from organization to organization, SAP may need to extend a greater volume of business process options than originally slated. The involvement of customers and partners voicing explicit requests will help lead this application vendor to the right level of offerings.

Security issues continue to plague the robust use of Web services and open SOA environments. Until proven scalable implementations can be presented to prospects, organizations will hesitate to advance mission-critical solutions onto this infrastructure. Some organizations are turning to consultants to provide the technical expertise in assessing the capabilities of SAP's products in this venue. SAP, which always has worked closely with world-class systems integrators and consultancies, must step up support for critical Web services security and identity protocols as well as educate this influential channel regarding its existing and planned capabilities. The same applies to service management concerns, with open acknowledgement that SAP's infrastructure must be a compatible participant of a greater deployment, management, and monitoring environment that exists at most large enterprises.

SAP has initiated an ESA Adoption Program geared to assist clients and partners with a methodology that engages critical stakeholders in overall opportunity assessments and design plans for implementing SOA. This program includes a series of workshops and service engagements that spans from generating overall SOA roadmaps to outlining blueprints for specific implementations and addressing ongoing management of such environments. It will be best if SAP assures that such an initiative is leveraged to educate, inform, and ultimately empower these individuals with flexible practices versus used as a static engagement.

Many organizations are entrenched in nearly decades old technology that will require significant upgrades to adhere to standards and infrastructure to adopt SOA. A path to advance adoption will mean offering incentives large enough to overcome cost and complexities in upgrading, including continuing to simplify configuration and upgrade processes, providing scalable deployment and sourcing models, and offering flexible pricing and product bundling.

## **BUILDING ON EXPERIENCE: STEPS TO CAPITALIZE ON SOA**

Not all applications will lend themselves to be services-based, and most enterprises do not seek to redesign 100% of their systems in this capacity. However, many organizations have started to amass Web services to such a degree that the development of top-down SOA structures and policies is now required.

Some companies are showing some concern regarding the sheer volume of standards and worry that additional fragmentation may occur among key software vendors. However, this concern is not stopping their intended adoption of SOA; rather, it is helping to fuel the perception that the ability to modularize and loosely-couple systems can help mitigate risk and decouple discrete technology decisions. To assume the entire industry will move in lockstep with all the growing layers of standards would be misguided.

Organizations that have instituted centralized architecture teams to facilitate application, service, and data practices have been most successful thus far in determining systems policy for and evangelizing the use of SOA throughout the enterprise. But more importantly, these teams are serving as critical resources to aid their respective organizations with best practices in designing overall business processes. They are doing this by contributing knowledge regarding the overall impact of change across the entire system ecosystem and in determining use cases that are the most suitable targets to deploy as services.

Although many vendors promote technologies that automate the creation and consumption of Web services-compliant code, it is in the best interest of organizations to obtain a keen understanding of the standards and rudimentary layers of the technology. Design practices are still evolving within this paradigm, with many hit-or-miss implementations that strive to tackle core issues of performance, security, and interoperability. This is a needed and natural step in cycles of innovation and transformation.

---

## **The Goal: The Dynamic Enterprise**

IT initiatives are no longer pursued for IT's sake; rather, they are all about empowering the business and preparing for future demands without necessarily having the advantage of knowing the explicit requirements of those demands. IT initiatives are about optimizing all dimensions of the enterprise for efficiency, fueling continuous innovation of products and services, extending information and processes to perpetually improve the customer experience, and effectively collaborating and communicating with all stakeholders in the expanding organizational ecosystem.

The use of standards and SOA design contributes heavily to a dynamic IT environment and ultimately a dynamic enterprise. Adopting these central tenets allows an organization to leverage various systems at a rate that is best geared to its own risk and budget profile, resource and skill level, and focused business requirements. Therefore, customer road maps may have some of the same general requirements, but the order of what, where, when, and how SOA technologies are adopted will vary. Because SOA is a very strategic initiative, it has become increasingly critical for vendors to expose their own realistic technology road maps with a proper degree of transparency. Therefore, vendors such as SAP are rolling out technologies and pre-announcing R&D efforts, anticipating the varied stages of customer adoption.

Each enterprise will measure and aspire to its own unique level of "dynamism" based on its individual purpose. It is about being nimble and adaptable. A fully integrated business platform can respond faster, and completely, to change — whether it involves fulfilling a new mandate or embracing a new market opportunity. Some organizations will push the envelope, automating event-triggered responses for highly integrated closed-loop processes, setting the stage for self-optimizing systems.

The recent wave to employ SOAs finds enterprises moving to embrace this situation and capitalize on the vast variety of solutions at their disposal rather than struggling with systems diversity. It is a gradual movement from server-centric to network-based computing, and although it can be complex and growing pains are inevitable, the end game is a more dynamic and interconnected business environment.

---

## **Copyright Notice**

External Publication of IDC Information and Data — Any IDC information that is to be used in advertising, press releases, or promotional materials requires prior written approval from the appropriate IDC Vice President or Country Manager. A draft of the proposed document should accompany any such request. IDC reserves the right to deny approval of external usage for any reason.

Copyright 2005 IDC. Reproduction without written permission is completely forbidden.