

THE **NEXT** REVOLUTION IN PRODUCTIVITY

Trapped inside your company's processes are activities that can now be swapped, bought, and sold. If you liberate them, you can create a radically more efficient plug-and-play business. **by Ric Merrifield, Jack Calhoun, and Dennis Stevens**



USINESSES HAVE BEEN reengineering their processes for nearly 20 years. For many companies, knitting together numerous fragmented tasks and data into cross-functional business processes has had a substantial impact in terms of cost savings, cycle-time reductions, and service improvements. However, many companies that embraced the reengineering revolution are now hitting a wall. Fortunately, the means to break through that wall are emerging. Thanks to the development of new technologies for using and sharing functions via the internet, the frontier is no longer the process but rather the business activities that make up every process - from pricing a product to issuing an invoice to

assessing the risk of individual customers to prioritizing the potential features of a new product in development.

It is becoming possible to design many business activities as Lego-like software components that can be easily put together and taken apart. What's primarily responsible is *service-oriented architecture*, a relatively new way of designing and deploying the software that supports a business activity. The beauty of SOA is that it allows activities - or processes built from such activities - to be accessed using the now-ubiquitous internet in a standardized fashion. Whether the capabilities that make up an activity are manual, fully automated, or somewhere in between, the SOA-based design of

their underlying software or electronic user interface allows the activity to be turned into a de facto web service. This transformation makes it vastly easier to share discrete activities and entire processes internally, to buy or sell them externally, to delegate their execution to suppliers or customers, and to update and maintain IT systems.

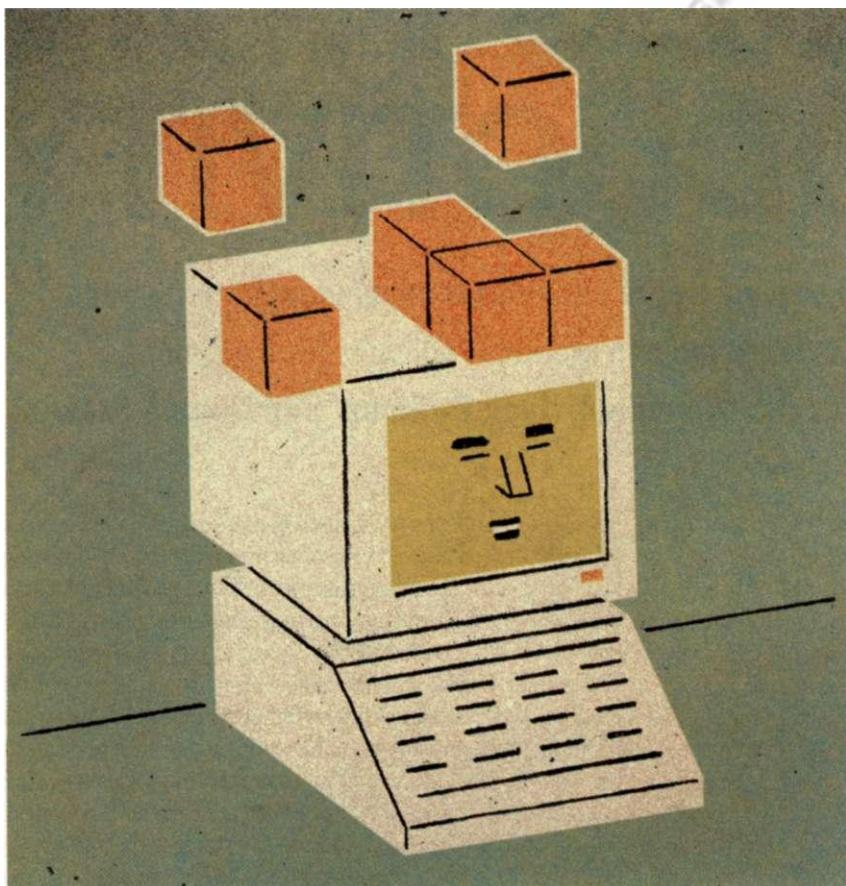
That said, obstacles to using SOA in this way exist. One is the lack of a universal standard: Vendors and industries currently use different versions of SOA. This is not a major issue, though, because systems using those various versions can converse with one another about most activities. Moreover, all signs suggest that SOA will become a standard overseen by a govern-

ing body of professionals. "The world is rapidly moving in that direction," says Mark Baciak, a senior technology architect at Microsoft, who pioneered SOA work at the software giant and several of its large customers.

A bigger obstacle is a familiar one: the gulf between corporate leaders and their IT departments. Chief executives have tended to see SOA as merely the next big thing being pushed by their CIOs and to assume that it, too, will end up costing a fortune without delivering commensurate benefits. Partly because of this fear and partly because CIOs have not understood or have had trouble articulating what SOA makes possible, most CEOs have authorized their IT departments to deploy it in a limited fashion - to improve and lower the cost of maintaining the software supporting existing processes. As a result, most companies that have embraced SOA have applied it without first rethinking the design of their businesses. This omission means they have overlooked SOA's greatest value: the opportunity to create much more focused, efficient, and flexible organizational structures.

Companies with which we have worked that have applied SOA only after redesigning their operations have eliminated huge amounts of redundant software, reaped major cost savings from simplifying and automating manual processes, and realized big increases in productivity. Harvard Pilgrim Health Care, the insurer, was able to shift non-strategic, or noncore, activities such as pharmacy-benefits management and disease diagnosis to companies that per-

MOST companies that have embraced service-oriented architecture have applied it without first rethinking the design of their businesses.



form them better. Motorola's mobile-phone business recently identified ways to standardize the previously proprietary processes of its customer-service call centers, allowing them to share software and cut their collective annual operating costs by millions of dollars. And in a test case that helped Baciak sell Microsoft on SOA, the software giant invested \$1.25 million in an SOA project that cut the annual cost of maintaining one set of IT systems by more than \$3 million.

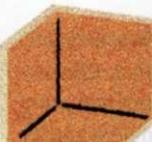
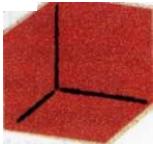
Achieving such gains, however, requires a sea change in operations-improvement techniques. In essence, it calls for the transformation of companies from collections of proprietary operations into a collection of standard plug-and-play activities.

The Value of Service-Oriented Architecture

Over the past 25 years, rapid advances in IT and operations design and practices revolutionized the way organizations conducted business and yielded huge productivity gains. The widespread adoption of quality-improvement methods such as total quality management and Six Sigma reduced waste and defects. Capitalizing on information technology, reengineering, and other process-redesign techniques helped organizations eliminate some tasks and integrate others that had been imprisoned in functional silos. The result was much more efficient, cross-functional processes for procuring supplies, taking and fulfilling orders, manufacturing products, providing services, delivering offerings to customers, and so on. Collectively, these innovations have helped companies reduce costs by hundreds of millions - sometimes even billions - of dollars, cut order-delivery times by 50% or more, and significantly boost quality.

For the most part, however, reengineering has involved re-casting processes and the information systems that support them in a proprietary, rather than a standardized, form - that is, customized for individual organizations. Such designs make it difficult and expensive for businesses to share, consolidate, and change processes. For example, you can't rip out FedEx's order-fulfillment process and the computer systems behind it (or any component of the process or the systems) and plug them into another company. That limitation has made it tough for FedEx to integrate the many logistics companies it has acquired.

Proprietary design, together with technology constraints that existed until recently, have kept the constituent activities of a process locked within it. Therefore, the activities could not be easily shared across processes or businesses. The result: Virtually all large companies suffer from an enormous duplication of activities; they continue to create and perform hundreds of noncore tasks that would ideally be outsourced; and they are spending exorbitant amounts on IT projects in order to support redundant and nonstrategic operations and to update core processes.



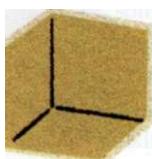
Imagine if a car manufacturer designed its motors and all the supporting parts (alternator, radiator, fuel pump, battery, and so on) so that it was impossible to replace one piece without replacing the whole system. That's the state of things at the vast majority of companies: They have operations supported by software that is not replaceable piece by piece - especially if they use cross-enterprise" software packages. Just replacing a motor, for example, requires an absurd amount of money.

One reason that reengineering focused on creating better proprietary processes is that 20 years ago, in the early days of the process-redesign revolution, the internet was not what it is today: an omnipresent computer network that allows organizations of all sizes, whether in Minneapolis or Mumbai, to easily and inexpensively plug into the same software modules. The only way to share pricing, accounts receivable, marketing, sales, and other capabilities that were automated or at least had electronic user interfaces was to build or lease a private network; for most companies, that did not make economic sense.

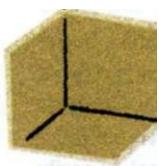
Also missing until this decade were methods of designing computer systems that permit capabilities to be shared over the internet as web services. That's the essence of SOA: It provides guidelines that allow software developers to design systems in stand-alone chunks of computer code, each specifying the critical outcomes, performance metrics, and interfaces between a discrete activity and other services. Consider a web service that one manufacturer installed to verify zip codes for its direct-mail marketing campaigns. The specified outcome was "validate zip code" - in other words, make sure mailings were not misdelivered. The two key metrics for this service were the accuracy rate of mailings (determined by the number returned because of incorrect zip codes) and the frequency with which the software found the right zip code for returned mailings. Specified interfaces included those with the "update customer address" and "handle returned mail" services.

When software is designed this way and placed on an intranet or the internet, anyone using SOA - any business unit in a firm and any customer or supplier - can plug in or remotely access the same software. Five divisions can use the same pricing calculator, eliminating the need for five separate systems. Outsourcing noncore activities becomes extremely easy. These attributes make SOA-based software far superior to both the customized software supporting proprietary processes and so-called "off-the-shelf" enterprise software packages.

Airline check-in is a good example of what this new world looks like. A standard interface allows passengers to check in



capabilities and how - as long as she has a satisfactory outcome. If the airline can find an organization that can produce the required outcome at a lower cost, it can simply buy and plug in that service. And when a superior provider comes along, the airline can easily unplug the existing service and plug in the new one. This is not science fiction; at least one major airline is doing it already. However, the reality is that a complex function like flight check-in is not just one activity or service but, rather, a bundle of several that can be independently swapped or reused in other functions.



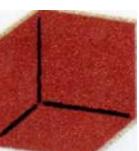
Unfortunately, few companies are using SOA to create more productive and focused organizations or to slash costs by purging duplicative operations and technologies. They are not revisiting the fundamental design of their operations.

Rethinking Operations

Turning companies into plug-and-play businesses is easier than reengineering in some ways and more challenging in others. It's easier because it doesn't have to be done in a big bang: Individual SOA projects tend to be of much smaller scope and shorter duration, and have a faster payback, than reengineering projects. What's more, turning a business into a collection of loosely coupled activities does not require that monolithic enterprise resource planning or customer-relationship management systems be overhauled or ripped out. To the contrary, when SOA is placed on top of them, it unlocks their proprietary language, making them more accessible.

Moving into the plug-and-play world is more challenging than reengineering because it requires more-profound operational and technological changes: for divisions to share operations and software, for companies to outsource far more than they do, and for business units to shift operations to customers and suppliers. Indeed, managers must adopt a whole new approach to operations design, which starts with a new unit of operational analysis - the level at which a company's operations troubleshooters diagnose and solve operational problems.

In the late nineteenth century, the unit of analysis was the worker's task, the efficiency of which Frederick Taylor's time and motion studies improved. Sixty or so years later, with the arrival of the mainframe computer, the key unit became the department. Then, in the late 1980s and early 1990s, when cheap PCs and internal networks allowed companies to connect departments economically, it became the cross-functional process. In the age of the internet and SOA, the unit of analysis is not a company's way of conducting its operations at all; it is the primary *purpose* or desired *outcome* of each activity, no matter how that activity is accomplished. For example, every company has either an internal or outsourced payroll process with a fundamental purpose of paying employees. Other common activities are capture customer



orders, secure supply, forecast demand, and plan replenishment. From a mile-high view, the operations of a typical large company comprise five to seven areas, 20 to 40 activities, 150 to 350 capabilities, and more than 1,000 subcapabilities.

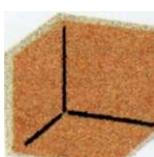
One of the biggest challenges in identifying duplications in work and technology is that the same or similar activities are often called by different names, even within the same company. Defining a company's operations in terms of the outcomes or purposes of its activities helps to solve that problem. It allows managers, operations designers, and technologists to see with crystal clarity the work - the operations and supporting technology - that their company's units, their customers, and their suppliers are duplicating. They can then identify which activities are strategic because they provide competitive advantage and should be kept in-house, which might be offered as services to other companies, which should be outsourced, and which of those retained need to be strengthened.

Only with this kind of atomic view can executives set priorities for initiatives to improve operations and their supporting technology. The method is pretty straightforward. We call it a *business capabilities analysis*.

Conducting a Business Capabilities Analysis

The first step involves drawing a diagram of the activities, capabilities, and subcapabilities in your business. Collaborating with the people who run a particular area of the business, you should describe its operations in terms of outcomes or fundamental purposes. This is easier said than done because people are used to describing the work they do ("We send a customer an invoice that requests on-time payment") and how they do it ("We check the order against our invoice. Then we call the customer to ask who should receive the invoice and how we should send it. On the due date, we check to see whether we have been paid."). They are not accustomed to talking about its fundamental purpose or outcome ("bill customer" or "collect customer payment").

The next task is to describe the crucial capabilities that support most of your business activities, including all the key ones. For the area "generate demand," the managers at one financial services firm listed three activities: manage partner relationships, market products and services, and sell products and services. We then asked them what capabilities supported



each. They came up with seven, for instance, for sell products and services: manage orders, manage sales, manage immediately filled sales, configure product pricing, manage contracts, qualify prospects, and conduct business intelligence. In all, it took about three weeks to define the entire company's capabilities and subcapabilities.

After mapping out the activities in your operations and the capabilities involved in carrying them out, it's time to identify the activities most critical to your company's success and to assess the health of all activities. If the executive team has

a general understanding of what drives revenue and profitability in the organization, the first task typically takes only two to four weeks. Even if executives agree on the drivers, however, they might find it valuable to bounce their perceptions off other people in the organization (functional heads, customer-facing managers, and workers) as well as customers, partners, and suppliers.

Because this exercise differs radically from operations-improvement methods that are now widely employed, we suggest starting small - with one or two groups of capabilities in a specific part of the business - in order to acclimate functional heads who must play a central role in the effort. This will challenge their mind-sets, get them thinking about

YOU can't just rip out a company's order-fulfillment process and plug it in at another firm.

what SOA-based systems should or should not be built, and help them understand the magnitude of the organizational changes that lie ahead. Typically, such initial efforts, which require only a couple of full-time people, can identify substantial opportunities for improvement in six to 10 weeks.

There are three basic criteria for determining which activities are most important to your business, which have underlying capabilities that need to be improved, and which are candidates to become web services:

- **Business value.** Does the activity (or the capabilities that deliver it) differentiate your company from competitors, greatly influence whether customers buy from you and remain loyal, or drive a key performance measure such as cost of manufacturing, product quality, or time to market with new products?
- **Current performance.** Is the performance of an activity's underlying capabilities excellent, inconsistent, or poor in terms of your company's needs and relative to competitors? How much investment is necessary to raise performance to the required level? Would the higher performance justify the investment?
- **Predictability.** Are the outcomes that an activity delivers (in terms of cost, time, quality, and so on) inherently predictable or not? The answer to that question is important because if the outcomes are highly unpredictable, the activity (or at least its user interface) will be difficult to automate. If it cannot be automated according to SOA

guidelines, sharing it with other divisions or shifting it to customers or suppliers will be difficult.

An important aspect of predictability is that some activities have inherently more unpredictable outcomes than others. Online companies like Amazon have highly predictable customer-ordering activities: When a customer orders online and provides the required information (including name, address, product selection, and credit card number), Amazon knows with certainty that the customer has committed to this specific order. In contrast, a management consultancy has trouble predicting precisely how many customers will say yes to its proposals and whether a particular customer wants exactly what the proposal offers.

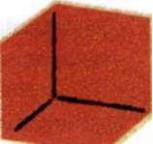
The managers leading your company's effort now can use the results of this analysis to produce a heat map: a diagram that lays out all the firm's activities and identifies those that are critical and those whose capabilities need to be improved. Of course, the capabilities to focus on first are the poor performers whose value to the business is high. (See the exhibit "Identifying Your Top Priorities.")

After piloting a capabilities analysis in one small part of its operations, a multibillion-dollar U.S. distribution company decided to create a heat map of its entire business. In particular, it wanted to know which capabilities were critical for fulfilling a mandate from its biggest supplier to dramatically improve satisfaction among the retailers and consumers who bought the supplier's products. The analysis parsed the firm's vast operations into about 20 activities and 140 capabilities. After asking managers in those areas about the value, performance, and predictability of each, they identified three activities with a total of 14 capabilities as the leading candidates for improvement - the ones with the greatest value, the most predictable outcomes, and the worst performance. Because 14 were too many to tackle at once, they decided to ask retailers what they thought the priorities should be. Three capabilities emerged: fix sloppy order fulfillment so that the right shipments go to the right retailers at the right time; give retailers sufficient marketing collateral to persuade consumers to buy the distributor's accessories; and track product sales more rigorously to help retailers weed out poor performers faster.

At this point, the distributor analyzed the people, processes, and IT of the three activities in depth. The solution for improving order fulfillment involved training retailers to use the existing technology; automation was the answer for tracking product sales. Not all the solutions identified were new. For example, some managers had long pushed the company to install product-information software to support the management and distribution of marketing collateral, but not until the capabilities analysis had been conducted did the business case for making the investment seem compelling.

Only after tackling these three priorities did the distributor return to the remaining 11. Although its overall improvement program is still a work in progress, customer satisfaction has already increased substantially.

One lesson of this story is that the heat map is strictly a tool for identifying priorities. By providing an overview of all the activities in a business, it can help managers throughout the organization agree on priorities for an improvement program - but managers must think long and hard about how many the company can realistically take on at one time. Otherwise, the program may go nowhere fast. A second lesson is that automation, including the implementation of SOA, is a means to an end and not an end in itself.



We typically find that as many as 20% of activities are primary and that 25% to 50% of all activities can be shared or shifted to external parties. The CIO of one manufacturer initially thought that only two divisions had redundant marketing data systems and subscription services but ultimately discovered that 12 divisions did. Consolidating them into an SOA-based system that all 12 could share cut the annual technology and data-subscription budget by \$40 million, allowed the company to redeploy 63 of the 70 staff members who initially supported the 12 systems, and made the new system accessible to divisions that previously could not afford a system.

A business capabilities analysis conducted in 2000 helped

Charles Baker, Harvard Pilgrim's then-new CEO, realize that he could transfer 40% of the insurer's operations to other companies that could perform them better. The heat map showed, for example, that one of the firm's most important capabilities was identifying subscribers who were in the early stages or at high risk of developing chronic illnesses like diabetes and heart disease. Spotting these people early would enable Harvard Pilgrim to enroll them in preventive care or disease-management programs before their conditions became serious. That, however, required sophisticated data-mining and data-analysis technology that

could comb through claims and other information. Recognizing that it lacked the technology and the analytical expertise, the insurer moved those activities to an outside specialist.

In the end, Harvard Pilgrim decided to focus its attention and resources on improving distinctive capabilities that provide a competitive advantage: customer service, creating new products, pricing health insurance (actuarial services), contracting doctors to participate in its network, selling to large groups, and marketing directly to individual policyholders. It had outside experts take over pharmacy-benefits management, several disease-management programs, behavioral health management, and claims processing. With the benefit of the capabilities-analysis results, the company could spell out precisely what it expected its dozens of contractors to deliver in terms of quality, cost, volume, and cycle time - and then could closely track their success in achieving that. Three separate finance organizations and their systems were consolidated into one.

Thanks in part to the business capabilities analysis, Harvard Pilgrim's streamlining of its operations has paid off. The insurer, which was on the verge of bankruptcy in 2000, is now solidly in the black, has a host of loyal customers, and has repeatedly received top awards or rankings for the quality of its services and customer satisfaction.

BUILDING or buying SOA software should be the last - not the first - step in creating a new operating model.

Notably, the distributor decided what to automate - and where to apply SOA - only after it had chosen the capabilities whose improvement was most critical to achieving its business objective.

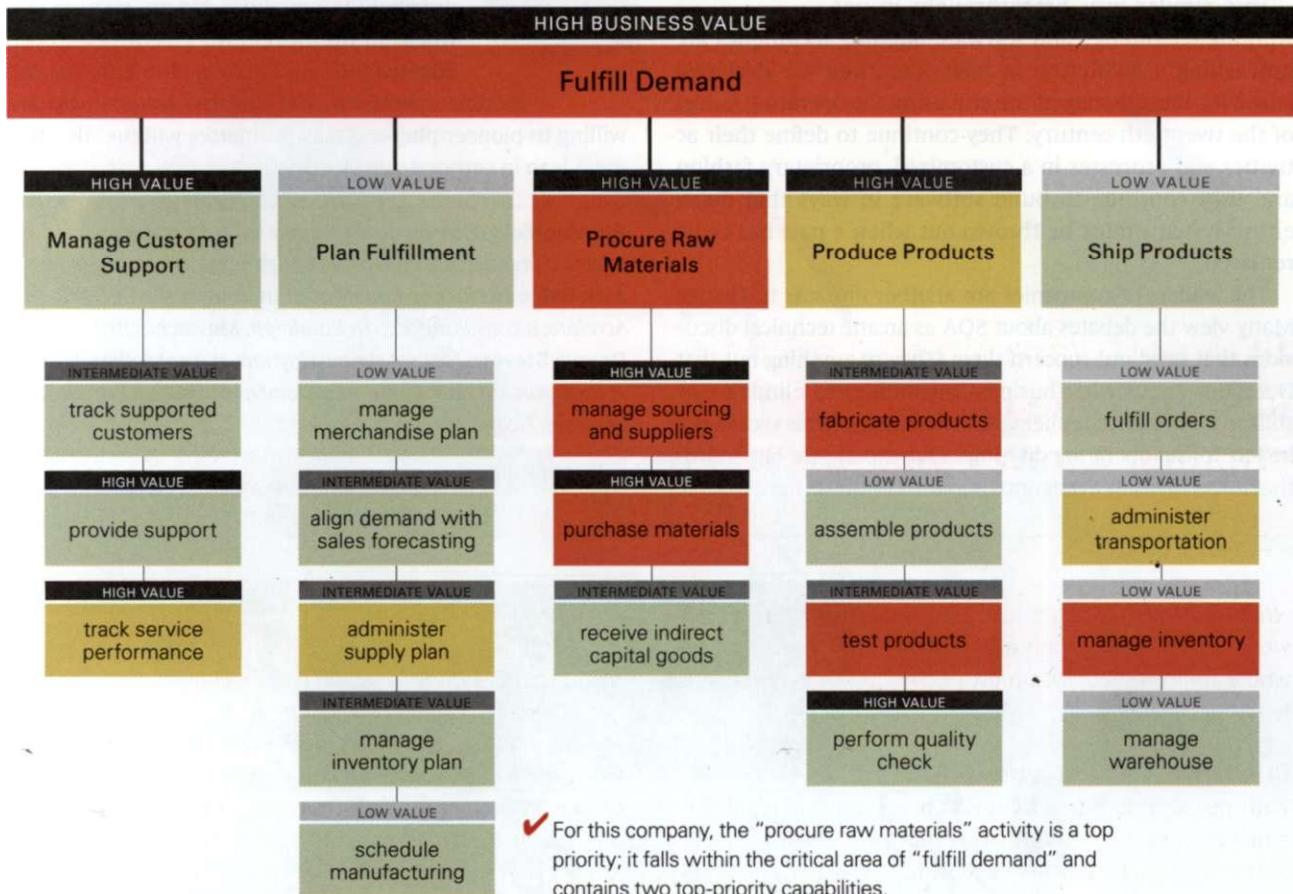
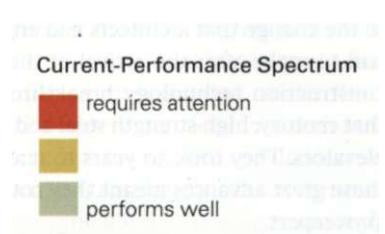
Creating a New Operating Model

With the heat map of activities in hand, managers will have much or most of the information they need to design a new operating model. They might want to probe a bit more - for example, to ascertain whether apparently similar activities in two areas are really the same, to check whether a standard process already exists, or to understand just how intertwined (or independent) activities are. Satisfied that they have an accurate picture of all activities, managers can then place them in one or more of the following categories:

- **primary:** activities that the company should keep in-house and that should be the top priority of programs to improve operations and technology
- **shared:** activities that can be shared with other divisions
- **shifted:** activities that can be transferred to customers, suppliers, or operational specialists
- **automated:** activities whose capabilities - or at least whose user interfaces - can be automated so that they can be turned into web services

Identifying Your Top Priorities

This greatly simplified heat map of a company's "fulfill demand" area includes five activities - manage customer support, plan fulfillment, procure raw materials, produce products, and ship products - and their associated capabilities. For each area, activity, and capability, the strip on top identifies the value to the business (high, intermediate, or low), and the color of the box indicates the current performance. Any element that is of high value to the business and whose performance requires attention is a top priority for an improvement program. (An analysis of which activities could become web services has not been mapped.)



✓ For this company, the "procure raw materials" activity is a top priority; it falls within the critical area of "fulfill demand" and contains two top-priority capabilities.

As we hope is abundantly clear by now, creating a new operating model does not begin with building or buying SOA software. In fact, that is the last step - one you should take only after you have identified your company's primary activities and determined which have capabilities or interfaces that can be computerized. While no two companies are alike, we know of some that cut their annual IT budgets by 20% by saving the automation decision for last.

However, once you've identified primary activities whose outcomes are inherently predictable, you should move aggressively to apply SOA. Though it can be as expensive to install as

any large software application, the investment will be worth it. SOA-based software can usually be updated in less than half the time needed for other software. After all, you can just plug in the new module without overhauling the software of related activities.

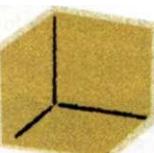
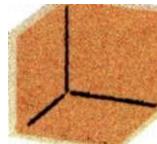
Barriers to Creating Plug-and-Play Businesses

Gartner, the IT research and consulting firm, reports that more than half of the mission-critical systems companies built in 2007 were based on SOA principles, and it predicts that the figure will exceed 80% by 2010. Shifting to the world

of SOA will be anything but easy, however. Adopting this new model requires a new mind-set for those who have been at the nexus of process improvement and technology. We compare it to the change that architects and engineers in the mid-i800s had to make after the arrival of the two biggest construction technology breakthroughs of that century: high-strength steel and electric elevators. They took 30 years to realize that these great advances meant they could build skyscrapers.

In a similar way, breakthroughs in networking technology and software-building techniques are unleashing a revolution in how operations are designed. However, most managers are still using the operating model of the twentieth century: They continue to define their activities and processes in a customized, proprietary fashion, and they continue to build software in ways that mean entire systems must be thrown out when a part has to be replaced.

The leaders of companies are another obstacle to change. Many view the debates about SOA as arcane technical discussions that need not concern them. They're anything but that. Decisions about what business capabilities to eliminate or shift to customers, suppliers, and outsourcing firms should not be left to the operating divisions. Our experience has shown that many division heads and their direct reports have trouble



letting go of activities - they either overestimate their importance or fear that sharing or outsourcing them will jeopardize the unit's performance. Consequently, the CEO must be deeply involved in deciding which work to do in-house, which duplications to eliminate, and which work to shift to outsiders. The CEO can and should be spared the process and technical details, but at the end of the day, he or she is the chief business architect.

New ways of constructing software combined with a computer network that can distribute the modules instantaneously anywhere in the world give executives unprecedented tools for building ultra-efficient and flexible operations. The business leaders who are willing to pioneer plug-and-play businesses will fuel the next great leap in corporate productivity. 9

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