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Application  
Innovation Services

# Changing the way industries work

The impacts of  
service-oriented  
architecture



## **IBM Institute for Business Value**

IBM Global Business Services, through the IBM Institute for Business Value, develops fact-based strategic insights for senior business executives around critical industry-specific and cross-industry issues. This executive brief is based on an in-depth study by the Institute's research team. It is part of an ongoing commitment by IBM Global Business Services to provide analysis and viewpoints that help companies realize business value. You may contact the authors or send an e-mail to [iibv@us.ibm.com](mailto:iibv@us.ibm.com) for more information.



# Changing the way industries work

## The impacts of service-oriented architecture

*It might seem natural for business executives to dismiss discussions of software design, but service-oriented architecture (SOA) is a high-potential technical innovation worthy of business executives' attention. Like the Internet, SOA has the potential to fundamentally alter how businesses collaborate and compete. And ready or not, it will change your industry.*

### Introduction

Back in the 1960s, when the concept of the Internet was first germinating, few people understood its full potential. But visionaries such as J. C. R. Licklider, who was part of the US Department of Defense's Advanced Research Projects Agency, had an inkling. If this network idea proved workable, Licklider predicted, "the boon to humankind would be beyond measure."<sup>1</sup>

It seems his predictions are coming true.

The Internet's impact has been particularly acute in the business world. In only a few decades, the Net – and the applications it has spawned – have become indispensable tools of business. Can you imagine a work day without e-mail? How many companies operate without a Web site? How many retailers have no online store? Even back-office functions like procurement have been totally transformed.

Doing business today is nearly impossible without the Internet. Eventually, we believe, the same will be true for SOA. Why such a bold comparison? In a word: flexibility.

At a time when companies are desperately in need of it, SOA opens an entirely new realm of business flexibility. Though SOA has profound technical advantages, it is ultimately about creating the means to innovate more rapidly – having the flexibility to introduce new products and services, enter or create new markets and revamp business processes... as soon as opportunities appear, or as soon as you happen to envision them.

Like the Internet itself, SOA has the potential to significantly change how businesses collaborate and how entire industries are structured. And given the competitive forces propelling its adoption, the question is not *whether* SOA will become pervasive – but *how soon*.



# Changing the way industries work

## *The impacts of service-oriented architecture*

**Although software designers have strived for this kind of modularity and reuse for decades, communicating across different computing platforms has always presented challenges. SOA is designed to eliminate that obstacle. Because SOA implementations rely on Internet protocols, they can use services that run anywhere, on anyone's computer.**

### **Flexibility pays off**

Bob slams his fist on the desk as he reads the press release about InsureIt winning the business of yet another major client.<sup>2</sup> The nation's largest provider network decided to go with InsureIt because it offered a standards-based set of information services that were easy to integrate with both small and large providers' systems. Information on insured patients' coverage could be easily accessed from individual physician's systems as well as by all the many complementary systems (registration, pharmacy, radiology and the like) that are required to operate a major urban hospital. "How can InsureIt integrate a new client so quickly? And offer so many sophisticated information services? It takes us three months just to connect our system with a client's – and we can only offer basic information support. Why is IT always such a bottleneck? We used to be the industry innovators. Why do we keep losing deals?"

Meanwhile on the other coast, Tom, the CEO of InsureIt, gleams as he reads today's news. "Four major wins this quarter with little competitive pressure from LegacyInsured. Who would have thought that the way we design our applications could make such a difference in our business flexibility? Ann, our CIO, told me that our newest capabilities – designed specifically for independent labs – were built using previously implemented patient information services and some new services created to access lab functionality in our existing systems. Barely any new programming was required. Even better, barely a dent in the budget. In fact, these laboratory services were what really sealed the deal with our new provider network client. From where I'm sitting, it doesn't look like we'll be blaming IT for missed opportunities any time soon. What our new 'service' orientation is really serving up is growth."

### **What exactly is SOA?**

Service-oriented architecture is a software design approach that dissolves business applications into separate functions or "services" – e.g., check credit history, or open new account – that can be used independent of the applications and computing platforms on which they run. When individual functions within applications are all available as discrete building blocks, companies have the ability to integrate and group them differently to create completely new capabilities (see Figure 1).

A common analogy for this reconfiguration capability is the popular children's toy: LEGO building blocks. Conceptually, a services orientation turns your entire application portfolio

– and that of your partners – into technological LEGO blocks that can be assembled in any number of configurations to meet changing business needs. But unlike a single LEGO block, which can only be used in one design at a time, a "service" can be used by several applications at once (much like a letter in a crossword puzzle).

This service-oriented approach simplifies communications among IT systems to the point that it doesn't really matter whether a particular "service" resides on your own computers or those of your external partners. After decades trying to stitch disparate platforms together "seamlessly," SOA finally makes it practical to collaborate extensively across enterprise boundaries.

FIGURE 1.  
SOA illustration.

**Business applications**

Fixed rate mortgage system (Packages)



Adjustable rate mortgage system (Custom J2EE)



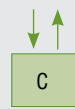
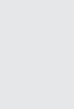
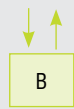
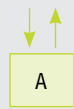
Unsecured loan system (.NET)



Integrated statement processor (Mainframe legacy)



**Broken into discrete services** (repeatable business tasks, e.g., open new account, check credit history)

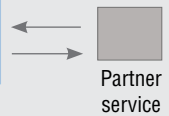
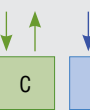
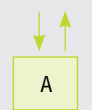


**New capabilities**

New hybrid credit product system that combines services from legacy applications



New WebCredit portal that assembles services from both internal and external sources



Source: IBM Institute for Business Value.

One of the most obvious benefits of this approach is increased business flexibility. Others include the ability to build new capabilities quicker and at lower cost. And because services are separate from the applications used to deliver them, companies

can prolong the life of existing applications and more easily integrate various types of applications and platforms.

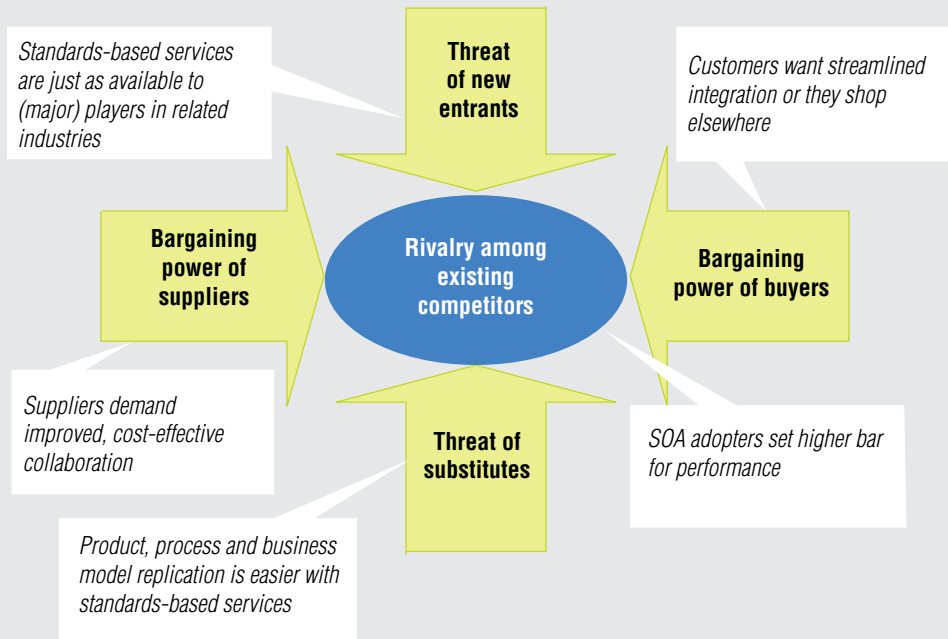
The value proposition is certainly attractive to individual firms. But is SOA really that significant to business in general? Can it influence the structure of entire industries?

## Reshaping the nature of competition in your industry

Because SOA's design philosophy enables entirely new ways for businesses to operate and collaborate, we anticipate that its adoption will cause shifts in the competitive landscape of virtually every industry. To test our assump-

tion, we used a model from Harvard Business School Professor Michael Porter as a template for analyzing how SOA influences the competitive dynamics within industries.<sup>3</sup> Although the degree of impact varies across the five competitive forces outlined in Porter's model, we believe SOA has significant implications in each area (see Figure 2).

FIGURE 2.  
SOA impacts each of the five forces.



Source: Adapted from Porter, Michael E. "Competitive Advantage, Creating and Sustaining Superior Performance," The Free Press, 1985; IBM Institute for Business Value analysis.

In our research sample, we saw evidence of SOA strengthening the competitive forces that shape industries.

To ground our academic analysis, we studied 35 real-life implementation projects to better understand how SOA was actually impacting individual businesses and their respective industries.<sup>4</sup> Although the motivation for each of these projects varied somewhat (see Figure 3), they were all responding to timeless business pressures – the kind outlined in Porter’s model. The experiences of these early adopters provide further evidence of SOA’s game-changing potential – and clear signs that its adoption is well underway in many industries.

**Suppliers**

Clearly, trading partners wield tremendous influence when it comes to technology adoption. As we’ve seen with e-procurement and more recently with radio frequency identification (RFID) technologies, dominant players can put tremendous pressure on their partners to follow their lead or risk losing an important business relationship. There is every reason to believe the SOA story will unfold the same way.

For example, a regional insurance carrier that was part of our study sample was selling annuity products through a major financial

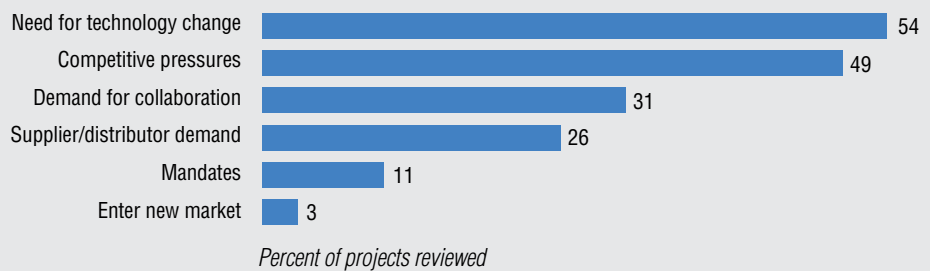
services institution. The process used to communicate product and transaction information between the two companies had become so cumbersome that the financial services company threatened to stop selling the insurer’s products. With US\$80 million in annual sales at risk, the insurer had to simplify the way it communicated with this important channel.

Using SOA, the insurer created a set of simple services that the financial institution could use to submit sales data. Services were also used to mask the complexity of interfacing with the insurance company’s various software packages. After the solution was developed, the insurer also opted to use the services in other internal applications to improve its own processing efficiency.

**Buyers**

SOA can sway customer expectations as well. As buyers grow accustomed to the streamlined, integrated solutions offered by more advanced SOA implementers, they will place similar demands on other businesses and industries. Indirectly, they’ll vote for SOA with their purchases.

FIGURE 3.  
**Key drivers for SOA projects reviewed.**



Source: IBM Institute for Business Value analysis.



**Although SOA impacts relationships with partners and customers, its industry-changing potential is most potent among competitors.**

Among the SOA projects we analyzed, several were responding to specific customer demands. One example involved a major telecommunications company. When this company's large enterprise customers purchased equipment, their orders typically included multiple installations and were part of a major construction or upgrade project. Both firms maintained order status and problem tracking information in their respective systems, which sometimes led to outdated or conflicting information. Even though these orders were considerably more complex than most purchases, enterprise customers were predisposed to having status information available on demand – just like they received through other vendors' online order tracking applications.

In response, the telecom company created Web services that allowed its customers' problem management systems to retrieve needed information from the telecom's internal systems. Not only did this keep customers better informed, the nearly seamless integration provided an extra incentive for enterprise customers to do business with this telecom provider rather than its competitors.

### ***The competition***

The sting of SOA will probably be felt most in the competitive arena, where it is enabling new entrants and substitutes, while fueling greater rivalry among existing competitors.

In the IBM Global CEO Study 2006, in which we interviewed 765 business and government leaders from around the globe, we found that 83 percent of those pursuing business model innovation thought it was "somewhat likely" or even "quite likely" that changes in a competi-

tor's business model would radically alter their entire industry.<sup>5</sup> Because of the flexibility it affords, SOA enables this sort of innovation.

SOA-based services can also stimulate competition by eliminating traditional barriers to entry. When "services" are locked inside proprietary software applications, the cost to replicate those functions can be prohibitive for a new market entrant. But when standards-based "services" are generally available, new players can access those capabilities just as easily as market leaders can. And as independent software vendors begin to make packaged solutions available as services, it will make it even easier for competitors to take advantage of SOA-based capabilities.

Returning to the building block analogy, LEGO markets "generic" building sets, as well as themed kits used to construct specialized designs like Harry Potter castles or Star Wars spaceships. Because they share common design principles, the pieces from these different sets can all be used together to create even more imaginative models. The same is true for SOA-based services. Generic services will coexist with specialized services pertaining to a particular industry.

When these services are available as discrete entities, all based on common standards, capabilities from various industries can be more easily combined to create entirely new products, processes or business models. And even though everyone will be able to access available services, industry newcomers could conceivably assemble more creative combinations because of their experience using a different set of "LEGO pieces." In effect, SOA shifts the challenge from coordination and connectivity to creativity.

Here's an example of how this played out in our study sample: The technology used to determine the location of a mobile phone has been around for some time, but traditionally these capabilities were only made available to law enforcement agencies. One mobile phone company that we studied decided it could use SOA to make these location-based services available commercially to drive new revenues.

The company created services that let businesses know where an individual phone is, whether it is off or on and even send messages based on its location. These services can be accessed by field force automation, delivery and distribution systems used by companies in virtually every industry. As this mobile phone provider crosses over into the software industry, it is positioned to influence how these packaged applications are designed and to become more involved in logistics and field force automation.

Like other new developments, SOA will gain momentum as standards mature and a critical mass of users develops. The fax machine's evolution illustrates this pattern.

Though the original facsimile machine was invented back in 1842 and improved over many decades, the technology was not used broadly until 1983 when the Comité Consultatif International Téléphonique et Télégraphique, a standards-setting body, established a standard protocol for fax transmissions.<sup>6</sup> In the ten years leading up to 1983, the number of fax machines in the United States increased by 270,000; but between 1983 and 1989, that total grew by 3.7 million.<sup>7</sup>

In the case of SOA, two types of standards apply: technology standards, which govern *how* services communicate; and industry-specific standards, which outline *what* gets communicated. The basic technology standards are largely in place and continue to be refined. And we expect critical mass to build even more rapidly in those industries that have already spent decades building and refining industry-specific data standards (see Figure 4). In fact, certain industries have already progressed to the point of publishing SOA versions of their standards (for example, banking and financial markets with Interactive Financial Exchange, and healthcare with Health Level 7).

FIGURE 4.  
**Examples of industry data standards that are well-positioned for broad-based SOA adoption.**

-  **Insurance** – Association for Cooperative Operations Research and Development (ACORD)
-  **Banking and financial markets** – Society for Worldwide Interbank Financial Telecommunications (SWIFT), Financial Information Exchange (FIX), Interactive Financial Exchange (IFX)
-  **Travel** – Open Travel Alliance (OTA)
-  **Healthcare** – Health Level 7 (HL7)
-  **Automotive** – Automotive Industry Action Group (AIAG), Standards for Technology in Automotive Retail (STAR)
-  **Telecommunications** – Enhanced Telecom Operations Map (eTOM)

Source: IBM Institute for Business Value.

**SOA enables not only constant differentiation, but also faster duplication, creating an accelerating treadmill of innovation.**

The speed and agility enabled by SOA will also foster greater rivalry. Players with SOA experience, established infrastructure and a sizable inventory of services will be able to assemble new solutions faster and easier than those that have to build traditional point-to-point or custom-built interfaces between systems. One just snaps things into place while the other has to spend time building the snaps.

Just as SOA will make it easier to pioneer, it will also make it easier to copy. We observed this in our research sample with a major car rental company. The firm used an SOA approach to provide services that could be accessed by an online travel site. It then offered those same services to other online travel companies, as well as airlines and hotels. But because the services were based on OTA industry standards, other car rental companies can easily follow suit and offer similar services.

Today, when a company introduces a new capability, it usually enjoys a reasonable period of time with a distinct market advantage before other firms can replicate its capability. But as SOA becomes pervasive, those periods of competitive advantage will likely grow much shorter. And although it might still be hard for SOA adopters to differentiate, it will be nearly impossible for SOA *abstainers* to keep pace with industry leaders.

### **Where should you start?**

Momentum is already building. Forrester Research found that 50 percent of the companies it surveyed have either implemented SOA already or plan to do so in the next 12-14 months. Even more telling, 70 percent of those that have SOA in place are making plans to expand their implementations.<sup>8</sup>

So what is the best way to get started? Fortunately, with an SOA implementation, you have options. You can buy it, build it or evolve to it. Many packaged software providers are making services available with their products. At some point, services could even be purchased on a per-use basis from service providers. The ability to “buy” outright or based on usage provides an ideal entry point for package-oriented firms or mid-sized companies that cannot afford to make substantial upfront SOA investments. Some businesses launch into SOA by building a new application from scratch, while others choose to transform their existing application portfolio over time.

Whichever entry method you select, the following principles – gleaned from the SOA-based projects that we studied – offer some practical insights for first-time implementations:

#### ***Focus on a real business problem***

The projects we studied were designed to address *business* issues. They consolidated information for customers, simplified processes for channel partners, improved customer service and generated additional revenue; almost none were focused on IT performance. In cases where the application contributed additional revenue, SOA benefits were more tangible and obvious. Selecting a revenue-producing opportunity not only makes it easier to convince the skeptics, it can also help fund further SOA investment.

#### ***Start small, but start now***

Most firms started with a small, self-contained project that they could use as a model to demonstrate what's possible with SOA. We recommend making the “service” as simple as

you can, as the learning curve and complexity of other project parts will be challenging enough. But it's also important to start now. Like virtually any new idea, SOA requires special business and IT skills – which cannot be developed instantly. And you don't want to be caught behind when SOA allows competition to shift into high gear.

#### ***Think long term when measuring return***

Many of the companies that we studied adopted a “just do it” attitude based on conceptual advantages, rather than a detailed business case. But whether you just assume, or actually try to quantify, the return on SOA investments, it is important to look beyond the initial implementation. Because a company's first application includes an upfront investment in infrastructure, the major payoff from using SOA typically comes in subsequent implementations.

#### **Who will benefit most from SOA?**

Given the nature of SOA and the industry changes it prompts, certain types of companies will benefit more than others. The following questions can help you determine whether your firm is a prime candidate to use SOA:

- *Do you have an extensive or dynamic set of trading partners?* SOA can help slash the amount of time required to get “up and running” with new partners. SOA presents the opportunity to create a single interface for specific functions that can be reused across multiple partners—regardless of the technology used by the partners.
- *Have you invested in a large number of custom-developed IT applications and interfaces?* Establishing Web services as the access point for these applications quite literally puts a fresh face on aging applications, often prolonging their usable life. This “face” also lets companies migrate the underlying application from old to new, without disrupting the users of the service.
- *Is your IT application portfolio extremely large or diverse?* The sheer size and complexity of some company's IT portfolios makes an SOA approach to integration financially attractive – even if the company never uses it to collaborate externally.
- *Do you regularly introduce new products and services that contain an IT component?* Companies with a sizable inventory of existing services are more likely to have the necessary pieces readily available to assemble IT support for new offerings.
- *How many of your IT applications support business processes that change frequently?* Again, having an SOA-based infrastructure in place – along with an existing library of services – helps the IT function respond quicker to business changes.
- *Are you competing in an industry where the barriers to entry are primarily related to having superior IT capabilities?* As services become the norm and industry standards emerge, many of these barriers will fall. Those lacking SOA experience and capabilities will be at distinct disadvantage.

**The future demands  
more flexibility; SOA  
supplies it.**

- *Conversely, are you in an industry where IT is inordinately complex?* In some industries, the IT environment has become so intricate that even a relatively simple change is risky – and often financially impractical. Rather than cede market position to more nimble competitors, companies can use SOA to escape rigid legacy systems.
- *Are you part of a business ecosystem dominated by a major player?* If so, you may have to adopt SOA to retain that relationship. How much do you know about that company's SOA strategy?

## Conclusion

Among the 765 participants in the IBM Global CEO study 2006, two-thirds said they expect *significant* changes for their organizations over the next two years.<sup>9</sup> With such upheaval on the horizon, companies need to become much more flexible.

Instinctively, it might seem appropriate for business executives to ignore IT architectural debates, but SOA is one worth understanding. At its core, an SOA investment is not about buying information technology – it's about investing in business flexibility.

Because SOA allows companies to design – and redesign – processes and business models with greater simplicity and speed, we believe it will fundamentally alter how businesses collaborate and compete. It is already changing how industries work – maybe even yours.

## About the author

Jay DiMare is an Associate Partner within IBM Global Business Services. He has over twenty-five years experience in the development of large-scale, complex, cross-organization applications in the financial markets, banking and insurance industries. He is currently the global leader for the Application Innovation Services team at the IBM Institute for Business Value. His recently published paper, "CEOs are expanding the innovation horizon: Important implications for CIOs," addresses the changing role of the CIO in the innovation process. He holds a patent for software algorithms applicable to document management applications, and he has developed IBM software products in partnership with clients. Jay is an IBM Certified IT Architect and a certified Master IT Architect with The Open Group, as well as a member of the IBM IT Architect Certification Board. Jay can be contacted at [jdimare@us.ibm.com](mailto:jdimare@us.ibm.com).

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## About IBM Global Business Services

With business experts in more than 160 countries, IBM Global Business Services provides clients with deep business, process, and industry expertise across 17 industries, using innovation to identify, create, and deliver value faster. We draw on the full breadth of IBM capabilities, standing behind our advice to help clients innovate and implement solutions designed to deliver business outcomes with far-reaching impact and sustainable results.

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- <sup>2</sup> InsureIt and LegacyInsured are fictitious companies and are not modeled after any company in particular.
- <sup>3</sup> Porter, Michael E. *Competitive Advantage, Creating and Sustaining Superior Performance*. The Free Press: 1985.
- <sup>4</sup> The original intent of our study was to develop a simplified means of identifying and measuring the return on SOA investments. We studied 35 SOA projects that spanned 11 different industries. Nearly half were being implemented in North America; another third were worldwide, and the remainder were from Asia Pacific, Europe and South America. During the course of our analysis, we observed real-life evidence of the industry-changing potential of SOA, which led to the development of this paper. To learn more about our original research on how to simplify ROI measurement related to SOA projects, please contact us at [iibv@us.ibm.com](mailto:iibv@us.ibm.com) to request a copy of *Service-oriented architecture: A practical guide to measuring return on that investment*.
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