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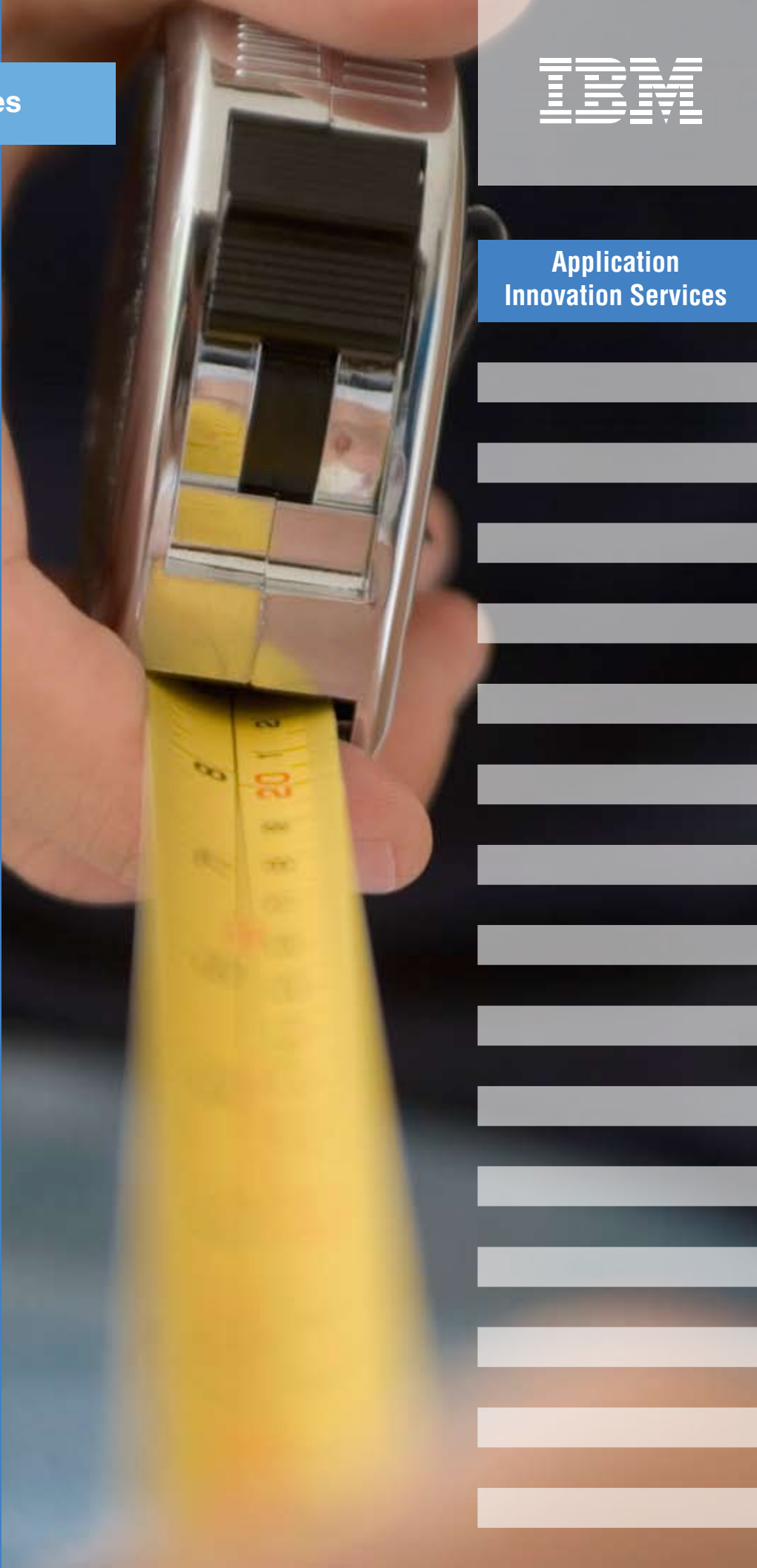# Service-oriented architecture

A practical guide to measuring return on that investment

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 for more information.

Service-oriented architecture

A practical guide to measuring return on that investment

With service-oriented architecture (SOA), good things don't come to those who wait. While companies shouldn't abandon building a business case for SOA, they should, in the interest of speed, take a simpler, more intuitive approach.

Introduction

Unless you've been incommunicado for the last few years, you've doubtless noticed the extensive press that SOA has recently received. Though the term can be intimidating, the fundamental concept is really quite simple – and very powerful. It's that to meet your present and projected business needs, you can turn your software applications into "building blocks" that you can infinitely rearrange, and usually at great speed. It gives you a new way not only to "reconfigure" your business, but to connect to suppliers, partners and customers.

Much like the Internet before it, SOA is sweeping through companies and industries, upending the competitive order. Thanks to SOA, companies are fast commissioning new products and services, at lower cost and with less labor, often with the technology assets they have right in hand. It's like discovering that with your existing condiments, you can make an entirely new and unexpected recipe, to the delight of your diners and of course yourself. Most important, SOA is helping to put IT squarely where it belongs: in the hands of the business executive, under whose direction it can create the most value.

This is, at any rate, the *theory* of the case – but, IBM wasn't content to accept the theory at face value. So we undertook to study 35 SOA projects, across a range of industries and regions, with which we were intimately involved.[1] We discovered that indeed, every last one of them exhibited improved flexibility, and the vast majority decreased costs – as well as realizing a host of other benefits. But we also discovered something very intriguing: Companies, if they developed a business case at *all* for SOA, weren't doing it in the traditional way – replete with exhaustive evidence. They all recognized the difficulties

and limitations inherent in building a business case for any fast-emerging technology. But whether they built a business case or not, they all *implicitly* understood that SOA entails massive business benefits – not least in the crucial area of innovation – and that given the speed with which SOA was conquering their industries, they had better get *on* with

it if they didn't want to be left out in the cold. Striking the middle ground – between *no* business case and the *traditional* one – IBM has developed a *simplified* approach to measuring the business value of SOA. That approach is the subject of this paper.

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SOA: A brief primer

First, what exactly is SOA, and why should companies press ahead with it?

SOA is an approach to designing software that dissolves business applications into separate "services" that can be used independent of the applications of which they're a part and computing platforms on which they run. When individual services within applications are all available as discrete building blocks, companies can integrate and group them in different ways to create completely new capabilities (see Figure 1).

A common analogy for this sort of software design is the popular children's toy: LEGO building blocks. A service-orientation turns your entire application portfolio – and that of your partners – into technological LEGO blocks that can be snapped into virtually any configuration. Since, like LEGO, the only real limit on what can be done with these blocks is the builder's imagination and vision – and no longer the technology itself (stripped of its rigidity and incompatibility) – SOA turns technology into a supple instrument of business strategy.

FIGURE 1.
SOA illustration.

Business applications

Fixed rate mortgage system (Packages)
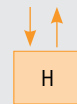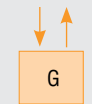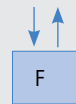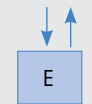
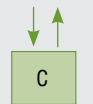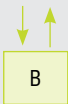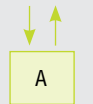Adjustable rate mortgage system (Custom J2EE)

Unsecured loan system (.NET)

Integrated statement processor (Mainframe legacy)

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

A   B   C   D   E   F   G   H

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
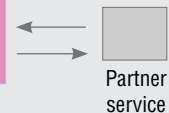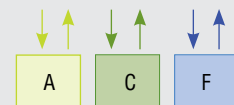
Partner service

B   C   G   A   C   F

Source: IBM Institute for Business Value.

The benefits to individual firms, as they themselves recognize, are substantial. Based on an analysis of 35 actual SOA implementations in 11 industries worldwide, we gained a very clear picture of the kinds of benefits firms are obtaining from SOA (see Figure 2).

As shown in Figure 2, *one hundred percent* cited improved flexibility, the root of all the other benefits. For example, for one of its brands, a large retailer with both a physical and Web presence redesigned its Website to better match the selling process in its stores. The store not only improved the business process for that brand, but, using SOA, availed the application for use across its multiple other brands. This new flexibility compounded the original benefits of shorter cycle times, increased collaboration, and reuse of IT assets. These benefits were typical of the projects we reviewed.

Therefore, the case for adopting SOA is exceedingly strong. But that doesn't necessarily mean that the way you approach it is predestined, or that you're absolved of the necessity to measure its benefits. Like any other investment, SOA has to be assessed systematically. To assist business leaders with this assessment, we suggest a method for analyzing SOA investments that balances rigor with the need to act fast.

FIGURE 2.
Benefits reported by the SOA projects studied.

Benefit	Percent
Improve flexibility	100
Decrease cost	97
Reduce risk	71
Increase revenue	51
Enable new products	43
Enable compliance	26

Percent
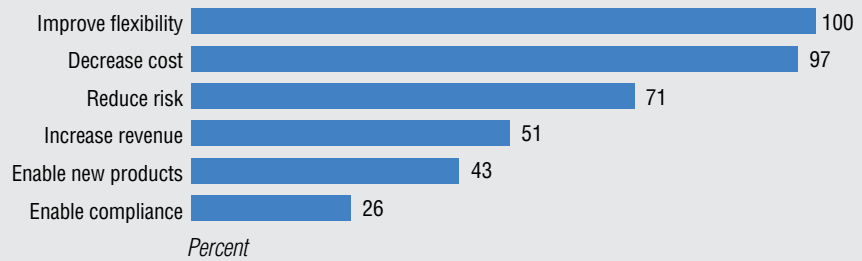
Source: IBM Global Business Services analysis of 35 SOA implementations.

The challenge with measuring SOA

"Not everything that can be counted counts, and not everything that counts can be counted."
– Albert Einstein [3]

Measuring returns on emerging-technology investments is notoriously difficult, but the problem is compounded when – as with SOA – implementations cross internal and external organizational boundaries, but budgets do not; when inadequate controls exist to measure performance; and when returns are at least partly dependent on external partners, or performance is measured elsewhere.

Indeed, numerous companies and individuals attest to the difficulty of measuring technology ROI. A British study found that 89 percent of companies use "intuition" or "guesswork" to calculate the ROI of IT expenditures, and that those that calculate it more precisely are predominantly medium-size and large organizations in the IT sector.[4] Echoing the frustration of many business and IT executives, Intel CIO John Johnson recently said, "It's not always easy to predict how you would even do an ROI analysis. You could spend a year figuring out ROI, and then you might have wasted a year."[5] Expressing the total return in precise financial terms is difficult – and can

sometimes be misleading. A CIO Magazine article quoted one IT executive as saying, "ROI has more credibility when it's stated in raw benefits, which are sometimes non-quantifiable, rather than translated into dollars. That translation is often fuzzy and tends to lose some audiences."[6]

Clearly, the attempt to measure technology ROI is fraught with difficulty. But then it isn't impossible and, done right, it can yield a wealth of valuable insight. Hence, we've developed a simplified framework for understanding SOA's return on investment.

The SOA investment analysis framework

We sought to simplify the measurement approach and make it more meaningful by doing several things: establishing a benefits framework specific to SOA, but without adding any predetermined metrics that project managers would need to collect; establishing a cost framework that focuses on limited choices and ways to depict the costs incurred; setting the number of implementations as the basis for including the time element to examine the return; and avoiding complex or indirect metrics such as labor learning curves, cost savings from the retirement of legacy systems and so on.

The investment analysis framework we propose has five primary steps:

1. Selecting the expected benefits from the benefits framework

2. Identifying the applicable cost scenario

3. Calculating the initial, simple return

4. Assessing and selecting the cost scenario for the second and subsequent implementations

5. Keeping the benefits constant, calculating the returns for the second and subsequent implementations.

We believe this method will make it quite clear – if it isn't already – that the benefits of SOA far outweigh the costs and that the benefits grow over time, while the costs decline.

1. Select the benefits received from the benefits framework.

The SOA benefits shown in Figure 2 – improved flexibility, decreased costs, reduced risk, increased revenue, the enablement of new products and services, and improved compliance – were analyzed to create the benefit value tree shown in Figure 3.

As Figure 3 shows, we found that we could distill the benefits into two broad categories: *improved flexibility*, culminating in *increased profitability* (from both increased revenues and decreased costs, a double boon not associated with most technologies). Further, we found that there were two major more-qualitative elements that contributed to increased profitability: *reduced operating risk* and *improved ability to comply*.

FIGURE 3.
Flexibility and profitability value drivers.

Source: IBM Institute for Business Value.
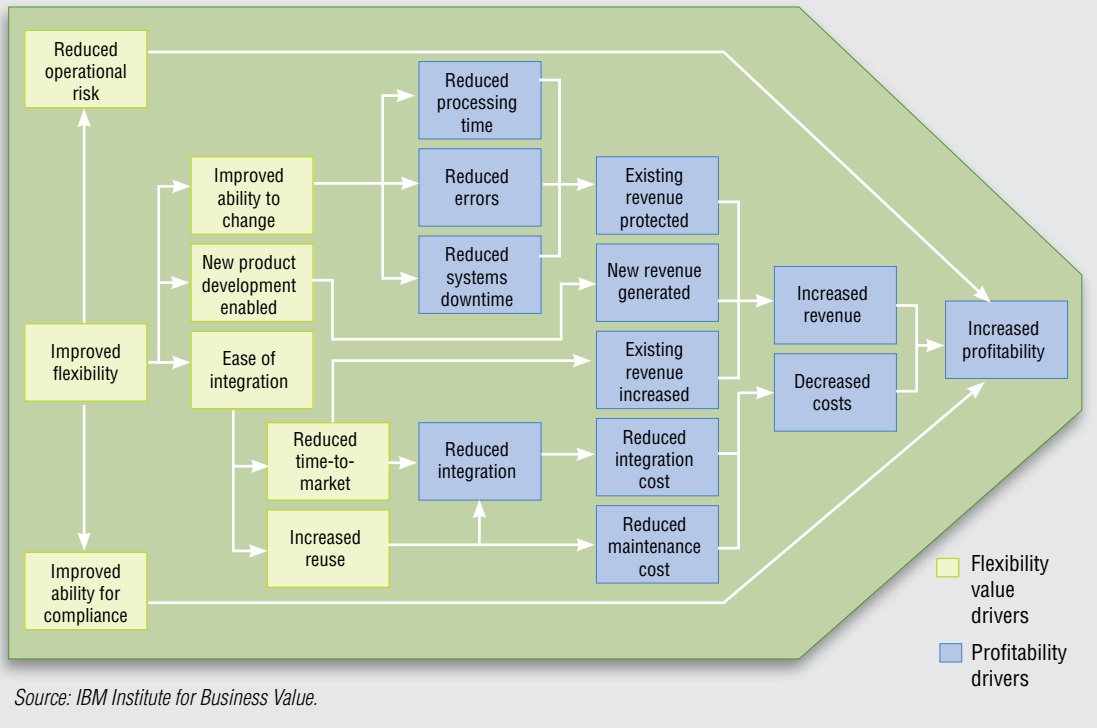
The benefits of SOA are very real, and they're extending from individual companies to entire industries.

A cellular telecommunications company we studied created an entirely new service – for locating cell phones – out of its existing IT assets. Though estimates vary, this capability could open up a US$2 billion market by 2009 for this telco.[7] A large agricultural machinery manufacturer needed to boost its ability to finance sales in its showroom. It tapped SOA not only to improve and expedite current lending practices, but to provide a new lending product to keep pace with competitive alternatives. It was able to double loan application volumes and increase the loan decision rate from 15 percent to 55 percent, all while maintaining prudent risk management levels.

A large insurance company that sells annuity products through a network of broker/dealers used SOA to streamline and automate data feeds, improve cycle time for data assets, protect an important sales channel, and position itself to reuse this data-access channel to sell through additional broker/dealers in the future.

If individual firms can extract these kinds of benefits from SOA, then masses of them are likely to adopt it, and whole industries are bound to change. Consider that according to IT analyst Forrester Research, 67 percent of the largest enterprises – those with 40,000 employees or more – will be using SOA by the end of this year.[8] Nearly 70 percent of enterprise SOA users say they'll increase their use of it.[9] Clearly, SOA has already reached a "tipping point."

How exactly could it change industries – or how is it changing them now? SOA could become the required way to collaborate among firms; dominant suppliers and buyers could demand it. SOA-enabled collaboration could cross current industry lines, inviting, among other things, the swift penetration of industries by new, unforeseen competitors. Even though SOA is relatively early in its lifecycle, it will soon become "table stakes" in many industries – particularly those where IT capability is a vital characteristic. By our reckoning, that includes most industries today.

Taking the logic a step further, it's not hard to imagine the advent of an SOA-enabled global economy one day.

These last two might not be obvious, but consider: SOA affords an alternative to "rip-and-replace" – the present outcome of technological obsolescence – by exploiting and extending the life of existing IT investments. And it provides reusable software, reducing the risk of delayed IT projects and thus increasing the likelihood of timely new product and service introductions. As well, SOA enables faster and more thorough compliance with external and internal mandates. How? By centralizing a common source of functionality, changes made to comply with the mandate can be done once and used throughout the enterprise, eliminating duplication.

The point is that though you can look at the benefits in Figure 3 in isolation and they'll be quite sizeable, to capture their full extent you have to factor in the impact that various benefits have on other benefits (e.g., from the chart, "increased reuse" leads to "reduced maintenance," which leads to "decreased costs;" or in another path, "increased reuse" leads to "reduced integration time," which leads to "reduced integration cost" and thus to "decreased costs"). In any event, the sum of the monetary value of all the benefits you deem applicable will be your overall benefit.

Of course some of these benefits will be difficult, if not impossible, to quantify (e.g., "improved ability to change"). But that doesn't make them any less real or important. If they're by nature not numerical proof of the benefits of SOA, they're certainly conceptual proof, and they constitute a powerful addition to the argument that SOA is worth the investment.

2. Identify the relevant cost scenario for your initial investment.

With SOA, costs vary based on whether you are *using* services, *providing* services or *both* (see Figure 4). Each of the components depicted in this figure include one or more cost elements, such as software, hardware and labor. To keep the evaluation simple, we've left out factors like learning-curve cost estimates, which are minor relative to the total cost and difficult to measure.

If you're only a service *user* (e.g., a Web-based e-commerce site using a shipping service), your application is using services made available to them by a service provider. The service provider could be other lines of business within your firm, your partners or, within the near future, external providers making services available separately. Your total cost would be to change your front-end application, allowing you to tap these services.

If you're a service *provider* (e.g., providing information services from your internal systems), you are creating services that others, within your firm or outside of it, can use with their applications. In this case, the total cost would be the SOA infrastructure, plus the development of new, or alteration of existing, applications, plus the generation of interfaces.

If you're both a user *and* provider, you would add user and provider costs together to arrive at the total cost of implementation. In this case, you're building the entire application, and incur the costs for all the components you see in Figure 4.
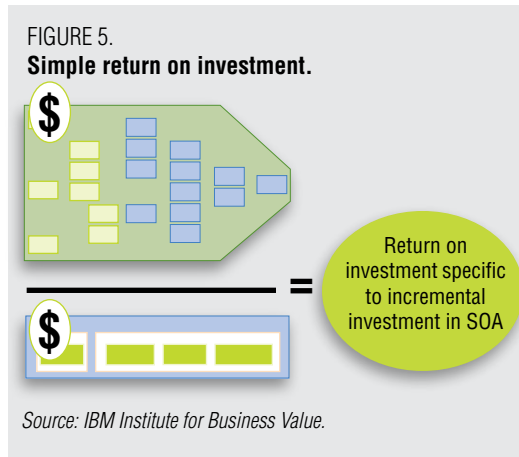
FIGURE 4.
Costs vary based on whether scope is A, B or C.
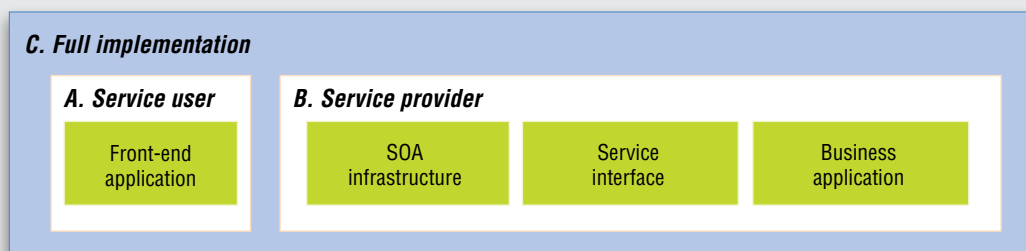
Source: IBM Institute for Business Value.

3. Calculate the initial, simple return.
As Figure 5 shows, the simple return is equal to the benefits you've assigned to SOA, divided by the cost scenario you've incurred.

FIGURE 5.
Simple return on investment.

Return on investment specific to incremental investment in SOA

Source: IBM Institute for Business Value.

4. Assess and select the cost scenario for the second and subsequent implementations.
The calculation shown in Figure 5 – for the "simple" ROI – applies to your first investment. When you move to the second implementation, you won't incur the cost for the infrastructure (typically the most expensive part of an SOA implementation); you'll just be reusing that infrastructure, lowering the total cost (see Figure 6). What's more, if you're just providing, or "exposing," services from existing applications, your cost is even lower – merely the cost to develop the service interfaces. At this point, you should be able to determine the cost for the second implementation and calculate the return for that implementation. And so on for all the succeeding implementations.

FIGURE 6.
Subsequent implementations require less build and spend.

First implementation

with infrastructure
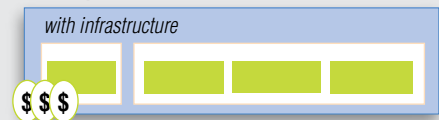
Subsequent implementations

building new backend functions

making services available from existing applications

Source: IBM Institute for Business Value.

5. Keeping the benefits constant, calculate the returns for the second and subsequent implementations.
Rather than picking an arbitrary number of years, we suggest using a time horizon of three or more implementations when calculating the return on SOA investments. Here's our rationale.

Most of the cost of SOA is in establishing it in the first implementation – which you can think of as the foundation, or platform. After that, thanks to reuse, the overall return rises, as Figure 7 shows.

FIGURE 7.
Return of succeeding SOA implementations.
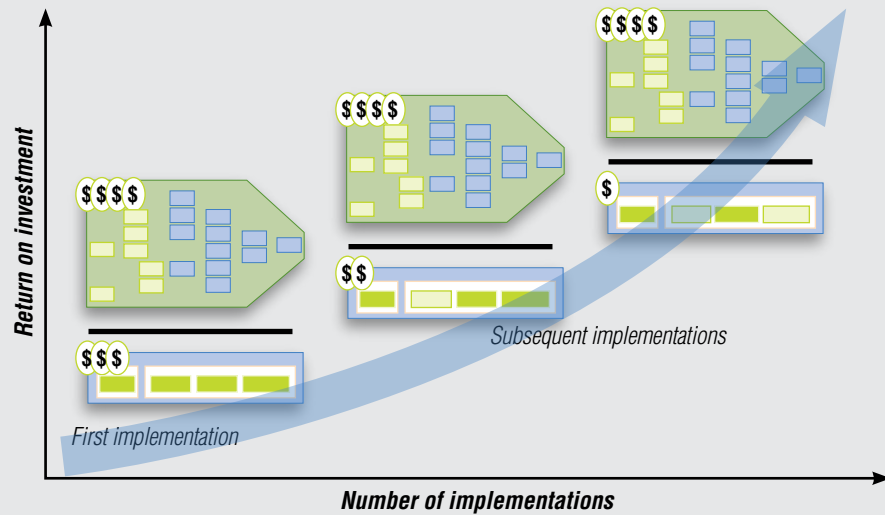
Subsequent implementations

First implementation

Return on investment

Number of implementations

Source: IBM Institute for Business Value.

Now, it's in the second and subsequent implementations using the same infrastructure that not only is the *real* return evident – but that it's likely to be higher than planned. For example, it's widely accepted that reuse yields benefits beyond what's immediately measurable as reusable application code is applied to new business problems. Large travel providers, for example, expose their online reservation systems to third-party Web sites (like travel agencies and other complementary travel providers), allowing for a big market expansion, at relatively little cost.

For revenue-generating SOA-based services, the returns can be even higher because applications that previously added only cost are now contributing revenue to the bottom line.

Another reason for using a multiple implementation time horizon is because business and IT benefits materialize on different timetables. As

soon as the first implementation is completed, companies can begin realizing IT-related benefits right away, as components of the solution are reused in subsequent projects. But business benefits accrue according to a different schedule – one based on the rollout of associated business changes, such as modified processes or new product launches. Because of the variances involved, the time horizon for evaluating returns must be long enough to encompass both the IT- and business-related benefits that materialize over multiple implementations.

Since SOA is so new, seeing will be a large part of believing. Many people will need to witness the first implementation to fully grasp the transformational power of SOA, not only technological, but strategic. As this awareness grows, it's likely that the demand for these SOA-based services will grow.

An illustration of the framework

To lend some concreteness to our explanation, we extracted an example from our analysis of the 35 projects we studied to demonstrate the framework. A large insurance company was setting up a claims application for one line of business and reusing interfaces to other systems for other lines of business.

First, we selected the expected benefits from the benefits value tree and established the costs incurred according to one of the three cost scenarios, as shown on the left side of Figure 8.

With its claims business solution, the company expected benefits such as:

- Reduced processing time, where the overall cycle time for claims processes was shortened on multiple claims-related activities

- Reduced errors, where costs and payments were reduced as a result of improved quality in execution and handling of claims

- Reduced staff, where fewer staff at multiple levels were needed to staff the revised processes

- Protecting existing revenue streams, where the improved process controls and improved management resulted in more favorable benefit and cost ratio results

- Increased sales, as new functionality helped retain existing policy holders as well as positively impacted new sales

- Reduced maintenance costs, as older applications were being phased out, their maintenance costs were being eliminated and the new application maintenance costs were lower.

The costs incurred were for the full implementation. These included the cost to implement the front-end application interface, a Web-based solution that was part of the business application, and a purchased software package. The SOA infrastructure required some software and hardware, as well as the labor costs to implement it. Last, the cost to develop the interfaces to other applications was added. This included the costs for the SOA interfaces needed for the other applications.

FIGURE 8.
Return on investment for example implementations.
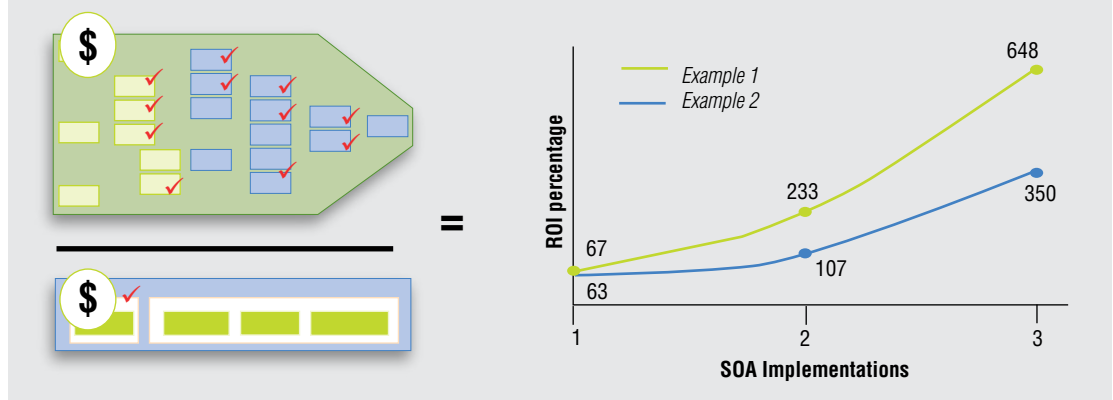
In this example, it should be noted that second and third implementations used the same infrastructure and the same services. As such, the second and third projects experienced much lower costs, as both services and infrastructure were reused beyond their original intent.

As we look at the ROI for this overall solution, the reuse of these components resulted in an exponential increase in the ROI (see right side of Figure 8). What's more, when we performed the same analysis on another project in the insurance industry, we saw similar reduced costs for implementation. This second project (example 2 in Figure 8) shows a similar curve, but a steeper return.

While the individual elements of the return calculation will likely vary project by project, a similar curve and return for successive uses of the same infrastructure can be expected.

Conclusion

No matter how you slice it, the case for SOA as a software design framework is very powerful. Chances are, because the business logic is so compelling, you'll deploy it sooner or later. The measurement approach we've suggested should help you to add simplicity, sense and speed to the process, allowing you to exploit the first-mover advantages momentarily available.

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. Jay recently coauthored a paper, "CEOs are expanding the innovation horizon: Important implications for CIOs," that 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*.

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About IBM Global Business Services

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References

[1] The intent of this study was to develop a simplified means of identifying and measuring the return on SOA investments. For the 35 projects we studied, we collected data through in-depth interviews with members of the actual project teams. The projects included in our sample spanned 11 industries. Nearly half of the projects were being implemented in North America; another third were worldwide, and the remainder was from Asia Pacific, Europe and South America. The detailed analysis of these projects led to the benefit value trees and cost scenarios included in our SOA investment analysis framework.

[2] Jim Smith and De Vine Enterprises are fictitious names and are not modeled after any company in particular.

[3] BrainyQuote. http://www.brainyquote.com/quotes/quotes/a/alberteins100201.html

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[9] Ibid.

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